CHRONOLOGY DEPT.

NATIONAL PETROLEUM NEWS

Volume 34 | July 29, 1942 | Number 30

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JUL 31 1942
DETROIT

RFC Will 'Assist' On Wartime Costs

WASHINGTON—RFC Chairman Jones announced July 25 that the government will "assist in financing" wartime transportation costs of the oil industry, and that the plan will go into effect Aug. 1. But so far no plan has developed and it is still unknown how far RFC will go. Page 3.

August Allowables Boosted by Ickes

WASHINGTON — Daily production of petroleum liquids in August has been set at 4,038,000 bbls. by Office of Petroleum Co-ordinator. This is an increase of 195,700 b/d over July recommendation. California boosted for 5th consecutive time; Illinois and Oklahoma down; Texas up. Page 20.

Solid Trainloads Haul Oil to East

WASHINGTON — New 60-car trainload plan for hauling oil to East Coast at express train speed is expected to reduce tank car turnaround time by 30%. Plan was developed by rails, ODT and OPC. New England oil men raise hopes cautiously over new relief measures in sight. Page 24.

Join the U.S. TRUCK CONSERVATION CORPS

Sign up here

Read Editor Platt's signed appeal for support of the U. S. Truck Corps. Page 28.

BULLETINS

TEXAS OIL HEARING

AUSTIN — Railroad Commission today set an unusual statewide hearing Aug. 7 to hear a complaint by Humble that August oil order does not allow it enough crude to produce critical war products as ordered by OPC.

Company said its August allowable gives too much West Texas oil for ordinary gasoline production, but allowable for Conroe type crude is so low "it will result in reducing our ability to produce toluene by almost 200,000 gal. during the month."

* * *

NEW RUBBER AGENCY

WASHINGTON—When President Roosevelt sets up the new, overall agency to handle rubber (promised to Sen. Gillette before veto of "alky-rubber" bill), he may call upon Morris L. Cooke to help. Mr. Cooke was FDR's "trouble shooter" in Mexican oil expropriation settlement.

* * *

SCRAP RUBBER

WASHINGTON—There's still a lot of scrap rubber to be collected, President Roosevelt says, and amount of raw materials collected in current national salvage drive will have a tremendous effect on all production.

* * *

PATENT LAWS

WASHINGTON — Assistant Attorney General Arnold is scheduled to appear before Senate patents committee on July 31 to discuss relation of anti-trust laws to patent pools and patents covering "high-octane gasoline" and synthetic rubber. However, Arnold may not reach gasoline or rubber in his first day's testimony.

* * *

TANK CARS TO EAST

WASHINGTON—OPC Transportation Director Parten told a congressional committee July 28 that railroads could not be expected to handle a sustained tank car movement in excess of 800,000 b/d. This implied that OPC expects the tank car movement to go well above 800,000 b/d at its peak. Not so long ago, OPC regarded 800,000 b/d as highest possible peak with a sloughing off to 666,000 b/d soon after.

Discover Shortcut On Ethyl Benzene

PHILADELPHIA — A shortcut process for making ethyl benzene, needed for manufacture of styrene for Buna type synthetic rubber, has been discovered by Atlantic Refining Co. The new process can be adapted to existing refining capacity now available and is offered royalty-free by Atlantic for the duration. Page 3.

Map 'All-Out' Drive On Oil Conversion

WASHINGTONN — Petroleum Co-ordinator Ickes is planning an "all out" campaign to get every fuel oil consumer in the East to convert to coal where at all possible. Several restrictions on deliveries for balance of summer are planned and OPA is working on a fuel oil rationing scheme. Page 5.

Treasury Renews Depletion Attacks

WASHINGTON — Depletion allowance is again under attack by Treasury Secretary Morgenthau. He tells Senate finance committee that allowances cost the government $200,000,000 a year and that U. S. could have financed all wildcat drilling in 1941 at one-third this cost. Page 20.

Pipeline, Canal Bill Approved by FDR

WASHINGTON — Construction of a cross-Florida pipeline and barge canal, and a crude line from Tinsley (Miss.) field to the East Coast, is approved as FDR signs H. R. 6999. Tinsley-East Coast project is similar to Trans-American Pipeline Corp's proposal once rejected by a special board appointed by Defense Transportation Director Eastman. Page 25.

NEWS BRIEFS

Truckers meet with Eisenhardt to discuss price ceiling. Page 25.

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Rail hauls to East decline 39,480 b/d. Page 25.

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OPC withholds comment on tubular price change. Page 20.

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OPC's Heroy aids in Illinois oil field survey. Page 21.

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Thompson re-elected to Texas Railroad Commission. Page 21.

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Phillips corrects erroneous reports of rubber role. Page 18.

* * *

WPB ready to requisition old idle equipment for scrap. Page 18.

* * *

ODT exempts tank trucks in Order 17. Page 25.

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Procedure for price relief given by OPA. Page 5.

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East's fuel oil users baffled by conflicting views. Page 5.

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OPA starts organization of 15 oil advisory committees. Page 7.

* * *

OPA cuts truck tire eligibility list. Page 7.

* * *

WPB puts final ban on metal oil cans. Page 11.

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Coupon rationing starts on East Coast. Page 11.

MERCHANDISING

Girlpower at work—Has the Venture Been Prudent or Foolhardy? 31

MARKETS

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REFINERY MANAGEMENT AND PETROLEUM CHEMICAL TECHNOLOGY EDITION—In 2 Sections, Section 1

STOP *the* LOSSES

OIL *is Ammunition*

Morrison Valves and Fittings will help to prevent this from happening to YOU.

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Fig. 155

Fig. 300

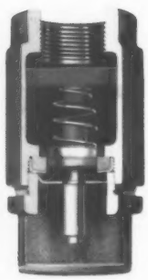
Fig. 133

Fig. 357

Fig. 335

MORRISON BROS. COMPANY
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Fill twice as many drums

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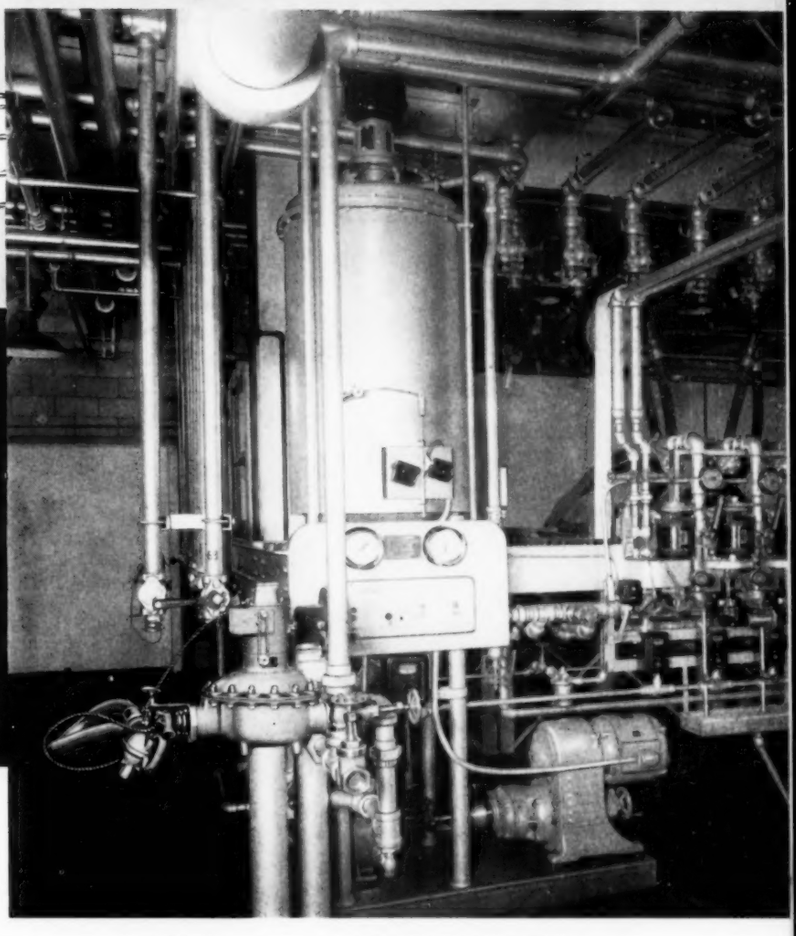
THE EMPIRE *Thermostatic* DRUM FILLER



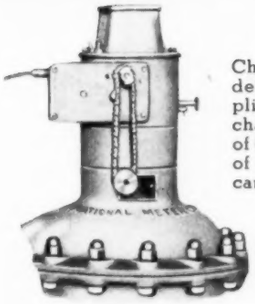
HERE'S an assured source of savings for refineries, distributing and compounding plants packaging lubricating, cylinder or engine oil, gasoline, kerosene or other petroleum products. The Empire Thermostatic Drum Filler so simplifies packaging that one refinery reports a 100% increase in barreling speed with, of course, a corresponding decrease in barreling costs!

This unusual unit offers every advantage, every saving of packaging by meter with accuracy of measurement assured through the automatic thermostatic correction of meter measurement to the exact equivalent of the desired volume at 60° F. It eliminates constant thermometer checking, reference to complicated charts and calculations, and requires no resetting of adjustments for temperature changes.

It is simple to set for the desired quantity; starts at the throw of a control handle and automatically stops at the completion of the desired volume. The operating range can be varied from filling 5 gallon cans up to 100 gallon containers.

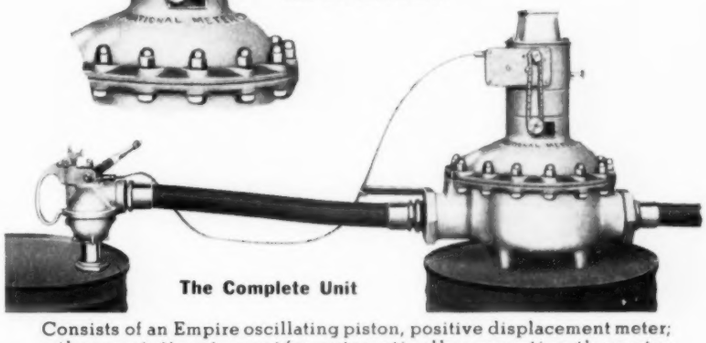
The Empire Thermostatic Drum Filler can be permanently located as shown in the large illustration, or picked up and moved from place to place as indicated in the cut at the right where the meter is shown placed on an empty drum.

Write for descriptive literature.



Length of Quantity Chain Determines Delivery Cycle

Changing from one predetermined delivery amount to another is accomplished by simply installing a quantity chain of the proper length on the side of the repeat register. Chains in units of from 5 to 100 gallons per cycle can be furnished.



The Complete Unit

Consists of an Empire oscillating piston, positive displacement meter; a thermostatic microset for automatically correcting the meter measurement to the exact equivalent of the desired volume at 60 F.; a repeat register with exterior mounted quantity chain having a fixed cam thereon which trips a mechanically operated control valve with non-foaming dripless nozzle of integral construction.

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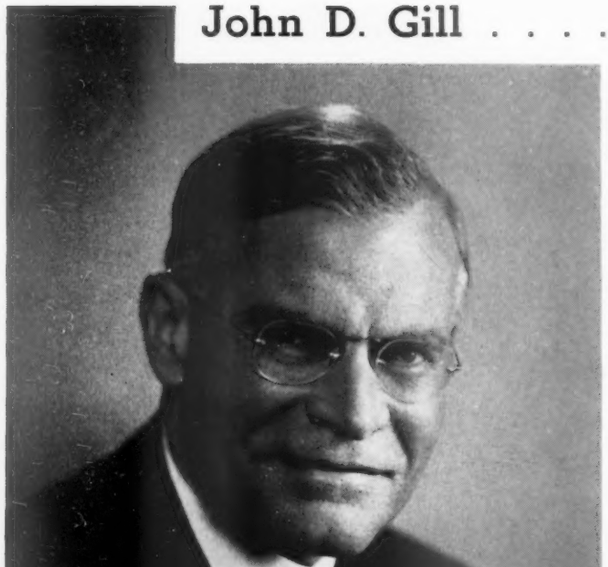

John D. Gill . . . . Leads Cost, Price Adjustment Study On Oil's Wartime Operations

● John D. Gill, who heads the Committee on Cost and Price Adjustment of the Petroleum Industry War Council, can "talk shop" with men from many branches of the oil industry and he feels as much at home with refinery and automotive technicians as with students of oil industry economics and marketing executives.

Born in Philadelphia, Mr. Gill graduated from Towne Scientific School, University of Pennsylvania, with the degree of bachelor of science in chemical engineering. The same year, 1911, he was retained by the Pennsylvania Military College where he taught physics and industrial chemistry until 1912. Then he joined Atlantic Refining Co. as a lubrication research technician.

Now economist and a director of Atlantic, Mr. Gill's thirty years with his company have witnessed his successful occupation of several important jobs, namely: director of Atlantic's control laboratory at Philadelphia; assistant superintendent of the company's Pittsburgh refinery; manager of personnel and organization of the company's sales division, located in Philadelphia; and economist and director.

Mr. Gill has been active in the Society of Automotive Engineers, his best known work in this connection being his contributions on lubrication principles to Day's Handbook. In 1937 he served on the petroleum industry committee of the conference on price research sponsored by the National Bureau of Economic Research.

Married, the father of two sons and a daughter, Mr. Gill's hobby is working with the Boy Scouts. He is a member of the American Economic Assn.; Franklin Institute; Royal Economic Society; and American Statistical Assn., Philadelphia Council.

NATIONAL PETROLEUM NEWS

VOLUME 34 WEDNESDAY, JULY 29, 1942 NUMBER 30

Steel Expansion Reduced 10%

NPN News Bureau

WASHINGTON—A 10% cut in a proposed expansion of steel capacity was recommended July 24 by WPB iron and steel branch as part of a drive to eliminate plant construction interfering with military production in 1942 and first half of next year.

A supply priorities and allocation board-approved expansion of 10,762,000 tons was cut to 9,710,000 tons which will bring ingot capacity to 98,279,970 tons by the middle of next year compared with present capacity of 88,569,970 tons.

Hits Registration Ban On American Cars

Special to NPN

TORONTO — Canadian Oil Controller George Cottrelle's request that three Canadian provinces deny motor car registration to American tourists, even though such tourists own property in Canada and make it their summer home, was termed "high-handed and improper," by T. B. McQuesten, Canadian Minister of highways for Ontario.

"This outrageous proposal will not be agreed to with my consent," Mr. McQuesten said. "For 50 years a large number of U. S. tourists have made their summer homes here and contributed to taxation revenue. They should not be driven from the province," he added.

Tourist Business Drops

Americans own $5,000,000 out of $25,000,000 worth of summer resort property in Ontario, T. H. Rand-McNally, manager of the Toronto Convention and Tourists Bureau, said. Ontario's tourist business so far this summer has been lower than in 1935, the worst year of the depression, he reported.

'Gas' Consumption in Ohio Drops 10% in May

Special to NPN

COLUMBUS — Taxable gasoline consumption in Ohio totaled 125,892,481 gal. in May this year, decline of 15,387,060 gal., or 10.891% from May, 1941 consumption, Ohio Petroleum Marketers Assn. reports. For first 5 months of 1942, consumption totaled 565,526,647 gal., decline of 4.568% from consumption in the like 1941 period.

OPA Grants Price Hike To 9 Indiana Dealers

NPN News Bureau

CLEVELAND — Price increases of from 0.25c to 1.25c per gal. were granted to 9 retail gasoline dealers, operating from one to 5 gasoline stations each, in Evansville, Ind., on July 18 by the regional office of OPA here.

O. D. Judd, senior regional price specialist, fuel division, OPA, stated that these increases were based on the operator's sworn statements as to costs, and in no cases were increases granted which gave the operator more than a 3c gross profit.

Only 2 requests were disapproved, these being where the operators were making more than 3c gross margin. Most of the petitioners were termed "cut rate operators". The average price for gasoline is now 15.5 for regular and 17.5 for Ethyl, Mr. Judd stated.

A.P.I. Plans Fall Meeting To Be Held in Chicago

NPN News Bureau

NEW YORK—American Petroleum Institute's 23rd annual meeting, Nov. 9 to 13, will be held at the Palmer House instead of the Stevens Hotel, as previously announced President William R. Boyd, Jr., reports.

U. S. to Help in Financing Oil's Extra Wartime Costs

NPN News Bureau

WASHINGTON — The government is going to "assist in financing" the extra, wartime costs of petroleum transportation and distribution to the Atlantic seaboard and the added expense of buying in the Mid-West instead of the Southwest —but just how, had not been decided four days after RFC Chairman Jesse Jones announced on July 25 of his willingness to do so.

Mr. Jones said the plan goes into effect August 1.

Thus, the burden of abnormal transportation costs, due to loss of tankers which formerly supplied over 90% of the East's requirements, will be assumed by the people of the entire U. S., not just Easterners through RFC financing from general tax revenues.

These costs, up to now, have been partially offset by OPA-approved price increases paid into the East Coast transportation "pool". OPA has indicated that it will cancel some of these price advances when RFC takes over financing of shipments to the East on and after August 1. A portion of the price advances will probably be permitted to continue so that deficit of the "pool", estimated at $38,000,000 as of June 30, can be wiped out.

DSC to Handle

Financing will be handled by Defense Supplies Corp., RFC subsidiary. It starts August 1, continuing until cancelled by mutual consent or on 30 days' notice by DSC. Costs to be paid will have to be approved by OPC, OPA and ODT.

"This action," said Mr. Jones' announcement, "has been taken to obtain the maximum production of petroleum products necessary to the war effort and civilian economy.

"Defense Supplies Corporation has agreed to pay abnormal transportation costs incurred in moving such products from the Gulf Coast area to the Atlantic seaboard, where a serious shortage exists because of submarine warfare. The abnormal costs are occasioned by the necessity of transporting such products by rails, truck and pipeline, rather than by tanker. It is hoped that by this arrangement the shortage on the East Coast will be alleviated, at least in part.

"Mr. Jones stated that Defense Supplies Corporation has also agreed to pay additional costs which might result from the necessity of obtaining such petroleum products in the Middle West instead of the Southwest, which is the customary source of supply. This will make possible the most efficient use of existing transportation facilities and will build up the supply in the East more rapidly."

Will RFC Buy and Sell?

One method suggested for RFC handling of this financing is to buy crude and products in the producing and refining areas, pay the transportation charges and sell at OPA "ceilings" on Atlantic Seaboard.

That would call for a large purchasing organization, probably leading to establishment of one-grade, wartime specifications for various products. This, it has been suggested, would encourage "pooling" of storage and simplify exchanges of products. How brands would fare under such an arrangement, is another matter.

Quick Ethyl Benzene Output Seen in Atlantic Discovery

Special to NPN

PHILADELPHIA — A new process for producing ethyl benzene, needed in the manufacture of styrene for Buna type synthetic rubber, has been discovered by Atlantic Refining Co. research engineers and its use could greatly speed the government's synthetic rubber program, Atlantic President Robert H. Colley announced here July 27.

The new process, Mr. Colley said, can be applied in existing refinery capacity now available and thus make unnecessary the construction of plants to produce ethyl benzene as originally planned by chemical companies—by polymerization of ethylene and benzol with aluminum chloride as the catalyst.

Ethylene, Mr. Colley said, is expensive and difficult to produce and, being a gas, is also difficult to transport. In addition, the catalyst in this original process requires aluminum and chloride, both strategic materials.

Involves Alkylation

Atlantic's process, on the other hand, involves simple alkylation of ethyl alcohol with benzene, using a phosphoric acid catalyst, and recycling, Mr. Colley explained.

Basing their attack on the knowledge that ethyl benzene could be produced by alkylation of benzene with ethylene, Atlantic research engineers substituted ethyl alcohol and found the alcohol was dehydrated to form ethylene in a single pass over the phosphoric acid catalyst and that, in the same operation, some of the ethylene thus formed was alkylated with the benzene to form ethyl benzene. Recycling of the

(*Continued on page* 15)

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NPN's Listening Post

Mid-Western oil companies may be asked to back a "voluntary" oil-to-coal conversion program in their territory.

* * *

Stations in the Pacific Northwest will soon be required (at the request of military authorities) to carry a minimum amount of gasoline in storage at all times.

* * *

Richmond is now favored as the northern terminus of Plantation pipeline extension.

* * *

Stoppage of all fuel oil deliveries on and after Oct. 1, 1942, to hotels, office buildings, laundries, multi-family apartments, etc., has been suggested. Appeals might be allowed on grounds that (1) substitute fuels could not be obtained or (2) conversion equipment was unavailable or too expensive.

* * *

Leon Henderson's civilian unit is preparing a rubber replacement plan, with ideas plucked from the tire manufacturers' "tires-for-all" program, the P.I.W.C. proposal, Ellender Bill and elsewhere.

* * *

Lube oil reclaimers are raising a war chest to fight expected proposals for federal tax on their product. Recently, their Washington representative resigned because of non-support. Now, the reclaimers have a new Washington representative. Contributions are being sought in amounts ranging from $2 a month (from operators of used-oil pickup trucks) to $25 a month (from operators of large reclaiming plants).

Goodrich Develops Tubeless Tire

Special to NPN

AKRON — Invention of a heavy vehicle tubeless tire is announced by B. F. Goodrich Co. Secret of the new tire is a specially-designed locking member which retains air in the casing, company says.

Company reports that a minimum saving of 7% in rubber is attained over the conventional casing, tube and flap ensemble.

The tire has undergone company tests and proven satisfactory, according to reports, and further tests are in progress.

Canadians are to use the Allocation Classification System (*NPN, June* 10, *p.* 10) in precisely the same manner as by Americans, according to WPB.

Humble Increases Wages; Cites 'Little Steel'

Special to NPN

HOUSTON—"Increased cost of living" has caused Humble Oil & Refining Co. and Humble Pipe Line Co. to announce a wage increase, retroactive to July 16, of 5.5c an hour for hourly workers and $10 a month for classified salary employes and wage earners. Hike will affect the majority of salaried employes, it is said.

"The different bargaining agencies (unions) throughout the company submitted briefs citing the increased costs of living," a Humble official said, adding "Our decision was based on the action of the National Labor Relations Board in the recent 'Little Steel' case".

Officials declined to reveal total of increases granted employes in the last 12 months—in addition to the present hike. It is said, however, that wages already were "above the general level".

Carter Hikes Wages

NPN News Bureau

TULSA—Effective July 23, Carter Oil Co. and Oklahoma Pipe Line Co. boosted the pay of hourly workers 5.5c per hour and increased pay checks of salaried employes $10 per month. No official statement concerning the advance was available from either company.

Story of Hoosier Drive For Rubber Written

NPN News Bureau

CLEVELAND — Highlights of the scrap rubber drive in Indiana have been carefully documented in a pressboard binder prepared by Sam T. Hurd, Indiana state co-ordinator of publicity for the rubber drive, with copies sent to interested parties including, mainly, those who took part in the Hoosier campaign.

Interesting because it relates the story of an achievement brought about only by the unstinting efforts of an industry whose members threw aside competitive considerations and worked shoulder-to-shoulder for a common, patriotic cause, the folder takes up, one by one, the factors contributing to success and tells some of the humon-interest stories behind the scenes. Hoosiers went all out in the campaign and are duly proud of their contribution of 11 lbs. per capita.

May 'Gas' Use Drops 29% In New York State

Special to NPN

ALBANY — Drop of 29% in gasoline consumption in New York State during May, when rationing became effective in all but 10 counties, has been announced by Carroll E. Mealey, State Tax Commission president. As rationing was not effective until May 15, its full effect will not be shown until June consumption figures are available.

Taxable gallonage sold during May was reported as 128,186,798 compared with 180,245,301 gal. in May, 1941. Taxable gallonage for the first 5 months of 1942 declined nearly 100,000 gal. or 14%, compared with the same period last year.

Total consumption, including non-taxable sales, was 139,561,780 gal. in May and 682,973,726 gal. for the first 5 months, losses of 51,300,000 gal. and 94,600,000 gal., respectively, from last year.

In terms of revenue, May decline means a drop of more than $2,000,000 in June motor fuel tax receipts.

Urges Oil Conservation, Not Coal Conversion

Special to NPN

BOSTON — Urging government agencies to "convert" their attention from conversion of fuel oil to coal burners and start a campaign of consumer conservation, the Atlantic Coast Oil Assns. conference had adopted a resolution to this effect.

A survey, this association says, shows that less than one-half of 1% of East Coast residential fuel oil consumers have converted to date and that the refusal to do so is economic.

Conversion costs from $35 to $150 for material and labor. However, this association believes that consumers of light fuel oils would spend money for installation of storm windows and insulation or mechanical work, thus protecting the investment in their oil burners. "This expenditure could be amortized and would not be a complete loss," the association holds.

Government is urged to discontinue all further attempts to promote conversion.

Britzman Named to Study Industrial Problems

NPN News Bureau

LOS ANGELES—Homer E. Britzman, assistant marketing director of District No. 5, has been named liquid fuels consultant by Petroleum Co-ordinator Ickes on the Pacific Northwest War Industries Commission. Ivan Bloch is chairman.

Oil Highlights From Canada

Canadian Oil Controller Cottrelle has moved to channel all available supplies and future production of benzol into preparation of aviation gasoline and synthetic rubber. He has prohibited its use in gasoline for motor vehicles, or any other use, except by permit.

* * *

• No person in Canada may spend more than $2500 for the conversion of his heating or power production facilities from oil or gas to coal or other fuel without license from the Controller of Construction. This order is designed to conserve steel and other materials needed for war purposes.

* * *

• To cover evaporation and handling losses, Canadian gasoline dealers are allowed 1½% more gasoline than the quantity authorized by the surrender of rationing coupons.

* * *

Bonded Truck Movement Allowed in Canada

Special to NPN

OTTAWA — Transportation of war materials by motor trucks in bond through Canada between points in U. S. is now permitted under authority of the War Measures Act in Canada. This permission will allow U. S. truckers to use the shorter Canadian route between Detroit and Buffalo.

Canadian railways, supported by Canadian customs authorities, have always bitterly opposed the measure though the rails have had this privilege for many years. Customs officials did not want the bother of supervising bonded shipments in trucks.

Colin Gibson, Canadian Minister of National Revenue, said the order was passed at "urgent request" of U. S. government.

* * *

Subsidize Tanker Rates

Special to NPN

OTTAWA — Subsidizing the importation of petroleum products into Canada by tanker has been authorized by Canadian Wartime Prices and Trade Board through the Commodity Prices Stabilization Corp. (a government company). The measure was made necessary by increases in cargo insurance rates of as much as 11¼% of cargo value, and by mounting transportation costs.

Exact amount of subsidy will depend on factors such as size of tankers, length of voyage and ports of call. It is expected to approach $30,000,000 annually.

NPN Reports

War Oil News and War Orders from

WASHINGTON

For ALL branches of the Oil Industry

WASHINGTON BUREAU, 1034-36-38 National Press Bldg. ● Telephone National 3477 ● STAFF: A. M. Petty, Warren W. Burns, O. H. Knight, James M. Collin

Ickes Maps 'All Out' Drive To Push Conversion to Coal

WASHINGTON — An all-out drive to "persuade" easterners to convert their oil burners to coal is being mapped by Petroleum Co-ordinator Ickes. And he will ask that oil companies carry the campaign right into the oil-heated homes of their customers.

President Roosevelt will lend his support to the oil-to-coal conversion drive, also.

Backing up the "campaign of persuasion" will be restrictions on fuel oil deliveries. Among steps being considered now are:

Restrictions Probable

Temporary tightening up of the fuel oil curtailment order, L-56, so as to prohibit deliveries of any kind of fuel oil in the Atlantic Coast area between now and Sept. 15 for space or central heating. Deliveries of 50% of last year's requirements for hot water and cooling systems will be permitted. (Order L-56 now permits 50% deliveries of fuel oil for heating purposes.)

Announcement that on and after Sept. 15 eastern fuel oil users will have to prove their inability to convert before they can obtain fuel oil supplies. And they will be limited to one supplier, so they cannot shop around.

Prepares Ration Order

OPA on the sidelines, now, is working on a fuel oil rationing order for the East.

Stoppage of all fuel oil deliveries in the East to apartment houses, laundries, hotels, bowling alleys and similar establishments, on and after Oct. 1, has also been suggested. Appeals would be heard on grounds that substitute fuels were not available, conversion equipment was not available or too costly.

Mid-western oil companies would be asked to join in a voluntary campaign to persuade their fuel oil customers to convert to coal.

Coal dealers are being urged to join the campaign, as many already are with newspaper "ads" saying that it is patriotic to convert.

Coal consumers—and the prospective converts from fuel oil—are being urged to load up with coal now, lest the heavy rail traffic this fall slow down coal movements.

Meanwhile, Federal Reserve Board has liberalized its restrictions on installment buying to encourage conversion to coal and to weather-strip homes and other heat-conservation measures.

Conflicting Views Baffle East Coast Heating Oil Users

WASHINGTON — East Coast fuel oil consumers don't know whether to convert to coal or to label present conflicting statements from government agencies "a big hoax" and forget it.

And as if to justify these beliefs, Wiley H. Butler, vice-president and general manager of Home Fuel Oil Co., Passaic, N. J., said, over 100,000 bbls. of gasoline was brought into East Coast daily, in excess of amounts allowed under L-70 during temporary gasoline rationing period, May 15 to July 22.

Mr. Butler testified July 28 before special House committee investigating synthetic rubber, gasoline and fuel oil.

Had 100,000 bbls. of fuel oil been brought in daily for next winter's household consumption, thousands of homes would have benefited, Mr. Butler said, adding that even now, counterfeit gasoline coupon books are being sold from 50c to $2 each.

Rep. Fitzgerald, Connecticut, committee chairman said conversion to coal would cost him $60 and he wasn't sure whether to do it. He added that many modern oil burning units cannot be converted.

"For morale effect", the entire country should get gasoline rationing, Rep. Fitzgerald said. Other committee members hinted that Mid-Continent area should be rational at once so that East Coast could benefit from tank cars so released.

Former Sen. W. C. Walcott, Conn., a retired president of Dunlop Tire and Rubber Co., suggested appointment by National Academy of Sciences of a committee of 3 to 5 rubber chemists to find the facts about current synthetic rubber muddle.

A 'Night Kiss' Please, And Check My Tires

WASHINGTON — "Night Kiss" is not the newest perfume from the ladies' boudoir although it does possess some perfume's knock-out qualities. Moreover, it has an octane number.

Right! It's gasoline, but differs from the ordinary products in that it's bootleg stuff, brought into or sold along the East Coast in violation of OPA curtailment or ration orders.

Fuel Oil Rationing? —Who Knows?

WASHINGTON—Fuel oil rationing?

WPB and OPA officials agree that somebody is doing something about it, but each thinks the other is doing it.

An OPA official of rank was asked about plans for fuel oil rationing.

"Yes," he replied, "some thought has been given to it, but WPB is doing it. I'll give you the name of the man handling it."

And he named a WPB official.

The WPB official was cornered.

"Yes," he said, "some thought has been given to it, but OPA is doing it."

And he referred NPN to the same office which had referred NPN to him.

OPA Gives Rules For Price Relief

WASHINGTON — Procedure for individual sellers to obtain relief from Revised Price Schedule No. 88 are contained in Amendment 23 to this general oil price regulation. OPA announcement said:

"This provides that a seller may file applications for an order of adjustment in accordance with Procedural Regulation No. 1 if it is shown that the established maximum price causes substantial hardship, is abnormally low in relation to the prices established for competitive sellers and that a maximum price more in line with competitors' prices will not cause an increase in retail prices.

"Sellers who believe special circumstances not specifically provided for warrant an adjustment of their ceiling prices may present such cases in an application for an order of adjustment. The amendment is effective July 29, 1942."

A similar amendment (No. 6) to Maximum Price Regulation No. 137 will be issued shortly, covering sales of petroleum products at retail outlets.

(Full text of Amendment 23 to No. 88 will be published in Oil-Law-Gram—Ed).

Anti-Freeze Regulation Relaxed By OPA

WASHINGTON — Tight inventory restrictions imposed generally by Priorities Regulation 1, which ran counter to seasonal buying practices of the anti-freeze trade, were relaxed by War Production Board to permit buyers to stock up during the summer.

In Amendment No. 1 to L-51, WPB said restrictions shall not apply to purchases and deliveries of anti-freeze, provided that the total does not exceed the amount required for use and resale in the April, 1, 1942-March 31, 1943 season.

OPC Foreign Unit Co-ordinates Work For Many Agencies

WASHINGTON—To co-ordinate all foreign petroleum problems, OPC's Foreign Division will continue to act in a liaison capacity, Deputy Co-ordinator Davies explains.

However, this division will have no responsibility for the allocation of 100-octane gasoline. This is now handled by a subcommittee of the Munitions Assignments Board.

Agencies for which the Foreign Division will act in a liaison capacity include the Department of State, Board of Economic Warfare, War and Navy Departments, War Shipping Administration, Office of Co-ordinator of Information, British Supply Council, American British Joint Survey Committee, Netherlands Petroleum Mission, China Defense Supplies, Inc., Office of Lend-Lease Administration, Soviet Government Purchasing Commission, South and Central American agencies, Allied Armed Forces and other similar foreign or domestic bodies handling foreign oil matters.

All questions relating to foreign production, transportation, refining and supply within OPC, are to be handled directly by the Foreign Division. OPC's Materials Division is to consult with the Foreign Division on questions of quantities of materials needed outside the U. S., technical requirements and possible substitutions.

Dodge to Assist Henderson In WPB Reorganization

WASHINGTON — War Production Board reorganization finds H. W. Dodge, Texaco vice-president, as assistant to A. I. Henderson who has been named deputy director general for industry operations. Henderson was director of the former materials division and Mr. Dodge was deputy director.

U. S. 'Gas' Tax Collection Down 15% in June

Federal gasoline tax collections during June dropped 15% below June a year ago. Comparative figures for the first 6 months of 1942 and 1941 follow:

	1942	1941
January	$37,798,026	$23,306,897
February	28,675,201	28,785,830
March	21,353,354	26,439,543
April	26,574,912	25,608,669
May	26,394,385	35,403,683
June	26,782,467	29,582,455

Reduced Automobile Use Accompanies Rationing

NPN News Bureau

WASHINGTON—Gasoline rationing on East Coast has been accompanied by a "sizable reduction" in automobile operation, OPA said today on basis of reports from 5 rationed states which indicated basic A books issued is 10% less than number of ration cards of all kinds issued under temporary plan. (May 15 to July 22).

In New Hampshire, Massachusetts, Delaware, West Virginia, South Carolina, a total of 1,061,465 "A" books were issued. OPA said that 7,745,382 ration cards of all types were issued under the temporary plan as against 8,522,820 automobile registrations in 1941.

Trucks Replace 1000 Tank Cars in East

WASHINGTON — Office of Defense Transportation's 48 state and 13 regional "Petroleum Transport Advisory Committees"—composed of carriers and oil companies—"are playing an increasingly important part" in diverting tank car hauls of less than 100 miles to tank trucks.

ODT reported that in a portion of the eastern states alone, at least 1000 tank trucks have been released for long haul service from the Mid-Continent and Gulf Coast.

"Principal function of the committees," ODT said, "is to assist in the diversion of petroleum and petroleum products from tank cars to tank trucks in hauls of less than 100 miles, in co-operation with the program of the Section of Tank Car Service. This program is designed to relieve the petroleum shortage in the East by making more tank cars available for the long hauls.

"In the last 3 weeks, at least 1000 tank cars have been released for long-haul service in this way in a portion of the eastern United States, and the number is steadily increasing. Once such cars have been released by diverting traffic to tank trucks the cars are expected to remain in long haul service as long as an emergency exists.

The acute eastern situation resulted in committees in that area going into action sooner than others, but ODT expects western groups to start functioning in a few weeks.

OPC Names Kinsolving To Transport Post

WASHINGTON — William E. Kinsolving, formerly general and operating superintendent of Sun Pipe Line Co.—Yount-Lee Pipe Line Co. trunk system, has replaced R. B. McLaughlin as assistant director of OPC's Transportation Division.

Mr. McLaughlin returns to his post as vice-president and assistant manager of both Texas Pipe Line and Texas-New Mexico Pipe Line Cos. Deputy Co-ordinator Davies says:

"The Office of Petroleum Co-ordinator regrets exceedingly the departure of Mr. McLaughlin from its transportation staff. He did a grand job and one which will be appreciated more and more as the results of his efforts, while in the government service, begin to make themselves felt."

Mr. Kinsolving started with Sun Pipe Line Co. as a field worker and progressed through the ranks. In 1930, he was chief engineer in charge of design and construction of one of the first gasoline-carrying pipelines ever built, the Sun-Susquehanna system.

A native of Corsicana, Tex., the new assistant director was graduated from Cornell University with an electrical engineering degree.

Derby, Dallas, Hudson Pools Get OPA Price Ceiling

WASHINGTON — Effective July 31, OPA has set a 60c per bbl. maximum price for crude oil produced in the Derby and Dallas pools and the Hudson Oil Co.'s production from the Hudson pool delivered at Lander, Wyoming.

Revised "ceiling" prices for these crudes, sold under a long-term contract to Indiana Standard, was contained in Amendment No. 24 to Revised Price Schedule No. 88, approved July 28.

(Full text of Amendment 24 to No. 88 will be published in Oil-Law-Gram—Ed).

Curbs Electric Motor Use

WASHINGTON — New electric motors will be released only to meet essential war and civilian requirements with other users forced to find used equipment, WPB said today, estimating that more than 1,000,000 motors of more than one horsepower are available over the country.

Northwest Supply Sources Switched In New OPC Plan

WASHINGTON — Marketers in the Pacific Northwest who have been getting their petroleum products from California now are being supplied by Inland Empire Refineries, according to OPC Plan No. 17.

Object of this plan is to assure an adequate flow of petroleum supplies to marketers in this area in view of uncertain and curtailed tanker deliveries from California. The plan has been approved by OPC's chief counsel and a letter dated July 7, approving objectives of the plan, has been sent by Deputy Co-ordinator Davies to Chairman Clarence S. Bessemyer of District 5 marketing committee.

According to this plan, arrangements have been made with Inland Empire whereby Shell ("under commitments subject to termination by buyer or seller at any time on 30 days' notice") buys 950,000 gal. of refined products, principally motor fuel, per month and resells following amounts to 3 other companies:

California Standard	250,000 gal.
Tide Water Associated	250,000 gal.
Richfield	100,000 gal.

Under similar arrangements, Union Oil Co. of California buys 300,000 gal. per month for its own use.

All Pacific Northwest marketers have a right to participate in these arrangements, the plan states.

Amounts the companies buy from month to month may vary, but must have OPC approval.

The plan explains that Inland Empire gets its crude from nearby states and can produce refined products in excess of its own needs.

WPB Gives OPC Control Over Oil Machinery

WASHINGTON — War Production Board's Special Industrial Machinery Branch has been liquidated and machinery transferred to OPC.

A. E. Collins—former assistant manager of purchases and stores for Shell at San Francisco—who was chief of the petroleum machinery section, was named administrator of Limitation Order L-83, restricting dstribution of industrial machinery. He will be in the Appeals Branch of the Priorities Division of WPB.

15 Oil Advisory Committees Under Organization by OPA

WASHINGTON — Office of Price Administration is organizing 15 committees, composed of oil men, to act as advisors on oil price actions.

OPA contemplates a general over-all committee to counsel on the national aspect of prices in general, backed up by 2 committees—a crude price and refined products price committees—in each of the 5 Office of Petroleum Co-ordinator districts.

These committees are called the "OPA Petroleum Industry Advisory Committees".

Committees Listed

Here is a list of them:

National Petroleum Industry Advisory Committee.

Petroleum Export Advisory Committee.

East Coast Traffic Committee.

West Coast Traffic Committee.

Natural Gas and Gasoline Committee.

Refined Products Price Committee for each of Districts 1 through 5.

Crude Oil Price Committee for each of Districts 1 through 5.

Thus far, officials said, the only committees fully organized are the export committee and the District 5 crude committee.

It will be up to each group, it was said, to name a chairman, and it is they who will decide how many other officers there shall be.

To Organize Slowly

Reliable sources, indicated the committees will be organized slowly. OPA seems to have no intention of calling them together immediately just to organize, calling on them instead when some problem arises.

Of course, an official said, if the oil men want to come in of their own volition to discuss some matter, OPA will say, "come ahead".

These committees are part of OPA's advisory panel organization. In this way, OPA has set up panels for various industries from which committees are drawn to advise on specific problems.

As an example, some of the industries represented by panels are agricultural equipment, bedding, canned goods, radio, armament steels, naphthalene, paraffin wax, and solvents.

OPA has yet another mechanism for securing the advice and assistance of industries. It is the so-called "Industry Council".

The industry council differs from the panels in this way: The council, composed of 12 men, works with Price Administrator Henderson. The Panel works with the price executive of a particular section.

Membership of the export and District 5 crude committees follow:

Export Committee

D. L. Harper, Standard Oil Co. N. J., New York; Laurence B. Levi, director, Socony-Vacuum Oil Co., New York; W. D. Anderson, Atlantic Refining Co., Philadelphia; C. E. Olmstead, vice-president, The Texas Co., New York; J. E. Black, Mgr. Foreign Trade Dept., Standard Oil Co. (California), San Francisco; C. S. Jones, president, Richfield Oil Corp., Los Angeles; D. W. Hovey, president, Gulf Coast Refiners Assn., Houston; G. L. Rowsey, president, Taylor Refining Co., Taylor, Tex.; Mr. Birkin, Asiatic Petroleum Co., New York; Jack Riddell, Jr. broker, 30 Rockefeller Plaza, New York; Arthur C. Stewart, Union Oil Co., of California, Los Angeles; Will J. Reid, Hancock Oil Co., Los Angeles.

District 5 Crude Committee

E. E. Pyles, 1160 Subway Terminal Building, Los Angeles; L. L. Aubert, president, Bankline Oil Co., Los Angeles; F. S. Bryant, director, Standard Oil Co. of California, San Francisco; L. A. Cranson, vice-president, Honolulu Oil Corp., San Francisco; E. F. Davis, vice-president, Shell Oil Co., Los Angeles; W. M. Keck, Jr., vice-president, Superior Oil Co., Los Angeles; A. D. Mitchell, independent operator, Long Beach, Calif.; L. P. St. Clair oil administrator, California Conservation Committee, Los Angeles; Lawrence Vander Leck, vice-president, Fullerton Oil Co., Los Angeles; W. C. Whaley, Barnsdall Oil Co., Los Angeles; Lloyd Williamson, California Star Oil Co., Los Angeles; William F. Humphrey, president, Tidewater Associated Oil Co., San Francisco; Richard Fenton, vice-president and secretary, California Stripper Well Assn., Los Angeles; R. E. Collom, vice-president, Continental Oil Co., Los Angeles.

FDR Praises Oil Industry On Rubber Campaign

NPN News Bureau

WASHINGTON — Mindful of the "grand job" done by the oil industry in collecting 453,155 tons of scrap rubber in the nationwide drive from June 15 to July 10, President Roosevelt sent following letter to Petroleum Industry War Council's William R. Boyd, Jr.:

"Please accept my hearty congratulations on the success of the campaign for the collection of scrap rubber. It is most gratifying to learn through your final report that the nation's stockpile has been increased by more than four hundred thousand tons and that the average contribution was almost seven pounds for every man, woman and child.

"You and your associates have done a grand job and I want you to know that your government appreciates the splendid results achieved. My heartfelt thanks to you and to all who work with you."

Truck Tire Eligibility List To Be Cut; August Quota Up

WASHINGTON — While the passenger car tire outlook appeared a little brighter by reason of the "tires for all" plan of the rubber companies, the pendulum swung the other way for truck tires with an OPA announcement that the list of eligible trucks is to be cut drastically.

Price Administrator Henderson said it would be necessary to further limit the number of trucks eligible for tires, because truck applications, running far ahead of quotas, exceed estimates made at the time rationing was initiated.

He said applications were coming in at a rate greater than was anticipated because of the heavy duty to which trucks are being put, with many units operating 24 hours a day.

"We took more than 100,000 trucks out of the tire market when we dropped beverage and other luxury carriers from the preferred list for replacements," Mr. Henderson said. "Now we must go much further, and we're making our determinations as to what new groups can be eliminated with the least harmful effects on our war effort and public necessities."

He warned that "any substantial tie-up of services trucks perform could defeat us more quickly than an invading army."

August Quotas Hiked

Partly because of this greater demand for tires and partly in response to seasonal factors, OPA on July 23 set August truck tire quotas greater than those of July.

The August quota is 316,695 new tires against 268,925 for July; recaps, 355,883 compared with 314,896; and 347,696 tubes against 299,265.

Car tire quotas also were enlarged.

For August, they are 58,308 new tires; 87,860 Grade II new tires for war workers; 637,959 recaps, and 418,910 inner tubes. July quota was 57,097 new tires; 23,402 new Grade II tires; 555,077 recaps, and 323,087 tubes.

Another development on the tire front was the warning from OPA that both retailers and wholesalers of tires are automatically licensed by General Maximum Price Regulation, and that the licenses would be revoked by violation of Price Schedules 63 and 143, which cover retail and wholesale sales, respectively.

WPB, which had previously ordered manufacturers not to make any more tire making machinery without specific authorization, relaxed this order in the meantime by allowing manufacture until Aug. 3.

General Limitation Order L-143, issued July 4, said tire making machinery should stop 15 days from date of issuance. Administrative difficulties forced the extension until Aug. 3.

Puerto Rico Rationed

An "extremely critical" gasoline shortage makes coupon rationing necessary in Puerto Rico, beginning August 1, OPA announced.

The regulations generally are similar to those governing the eastern seaboard, OPA said, except that the value of each coupon will be less with the "A" coupon valued at 1 instead of 4 gal.

Washington Personalities

M. R. Singleton . . . Oil's Wartime Scrap Drive Chief

There was a dull boom as 575 qts. of nitro glycerine exploded prematurely in a gas well.

And M. R. Singleton was trapped—trapped within 20 ft. of 100 more qts. of nitro which were struck by particles of rock spewed from the well.

Mr. Singleton, now salvage director for the petroleum industry in War Production Board's Conservation Division, at the time was drilling the first shale gas well in the Tug River section on the Kentucky-West Virginia border.

While the last shot of nitro was being lowered into the well, Mr. Singleton was back in a shed, tying on his boots. A thud bespoke the underground explosion

Suddenly realizing what the thud was, he raced for the door of the shed, but it was too late to run away from the well. The rock already was belching from the well—and pattering on nitro cans only a few feet from him.

"For some crazy reason," he said he ran to a 2.5 or 3 ft. flange wheel, curled up in it for protection, and wondered if it would hurt when he "conked out".

"I made myself darned small," he related. "It scared me out of 7 years growth and I walked away from there an old man."

Oil man, soldier and cowboy, Mr. Singleton directs the WPB organization that promotes scrap collection in the oil industry which is far ahead of any other industry in bringing in dormant and demolition scrap—more than 400,000 tons since this spring.

Punched Cattle in California

Born in Andrew County, Mo., in 1880, Mr. Singleton's first job was punching cattle on the Moulton Ranch in the Sacramento Valley of California.

After clerking in San Francisco for a number of years, he went to Cincinnati where he worked for several railroads and Standard Oil of Kentucky. He left his position as General Agent of the Erie Railroad in 1917 to enter officers' training school where he was commissioned a second lieutenant.

His trick in th Army was spent on this side, but immediately after the war he was one of 27 Army officers tagged by Uncle Sam to help out on an ambitious undertaking of establishing trade routes. East officer was assigned to a certain ship, and given the job of collecting certain trade information—in addition to other duties.

Mr. Singleton was assigned to the S. S. Sacandaga which visited the west coast of South America and then took a load of food to Poland—via Danzig, then in Prussia. These were the first voyages the ship ever made.

Entered Oil Business After War

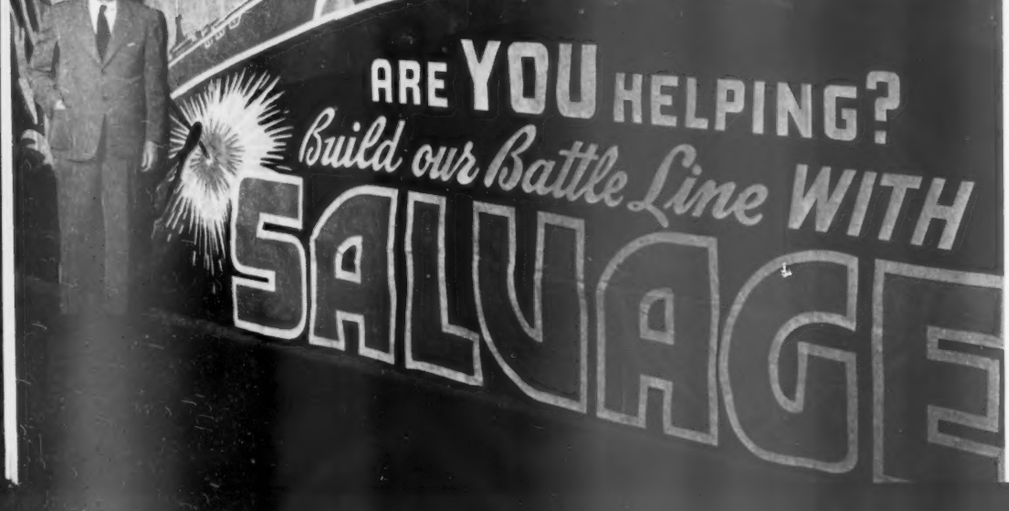
Returning from this service, he jumped head first into the oil business and has been there ever since.

He first joined the Petroleum Refining Co. at Latonia, Ky., for whom he built and operated a crude pipeline in the Bowling Green, Ky., field. While general manager of this company, he became general manager of th Bald Rock Oil Co., and vice-president of the Paragon Refining Co., Toledo.

All of these companies were sold and in 1930 he became manager of physical properties of Valvoline Oil Co. of which he subsequently became vice-president.

For Valvoline, he constructed and operated deep sea terminals at Edgewater, N. J., and Portland, Me. In addition, he took over the operation of the company's marketing of light ends through stations and bulk plants in Pennsylvania, New York, Connecticut, Massachusetts and Maine.

Mr. Singleton, whose office is adorned with a huge poster boosting the salvage campaign, has a son—D. Singleton—a naval officer at Pearl Harbor, awarded the Navy Cross for "extraordinary courage and disregard of personal danger" in the Pearl Harbor attack. Another son, Philip, is a gunner in an anti-tank outfit now on maneuvers.



M. R. Singleton (above). Mr. Singleton (left) beside a mammoth poster promoting the salvage campaign

'Tires for All'—The Rubber Industry's Program

WASHINGTON — The Japs have the rubber plantations, the military has the crude rubber stockpile and synthetic rubber output, but the tire industry has the plan to give us all tires anyway.

That isn't quite as contradictory as it sounds. And it isn't done with mirrors.

Secrecy hid the plan from public gaze until government officials were given a preview.

The idea is to give everybody tires for necessity purposes by making only a small dent in the crude stockpile, turning up a nose at Buna-S and Neoprene (which Messrs. Stimson and Knox wouldn't give up anyway), snatching only 15% of the rubber reclaiming capacity, and grabbing off a lot of Butyl (flexon) and Thiokol.

Stage Exhibit

To show what they had in mind, the tire men fixed up a big exhibit and brought it right down here to Washington, where they hid it temporarily in the Willard Hotel's Congressional Room.

Government brass hats viewed it at a premiere showing and then the press barged in, dodged a fake rubber tree complete with latex cup, and heard President A. L. Viles of Rubber Manufacturers Assn. say:

"This is a physical portrayal of a plan to meet a desperate situation."

Around the oblong room stretched booth after booth, showing natural rubber, Buna-S, reclaimed, Thiokol, Butyl, (Flexon), and ways to conserve tires.

And before each booth was a reasonable facsimile of a side-show barker, wand and all. But these barkers happened to be top flight scientists or experts in their own particular fields.

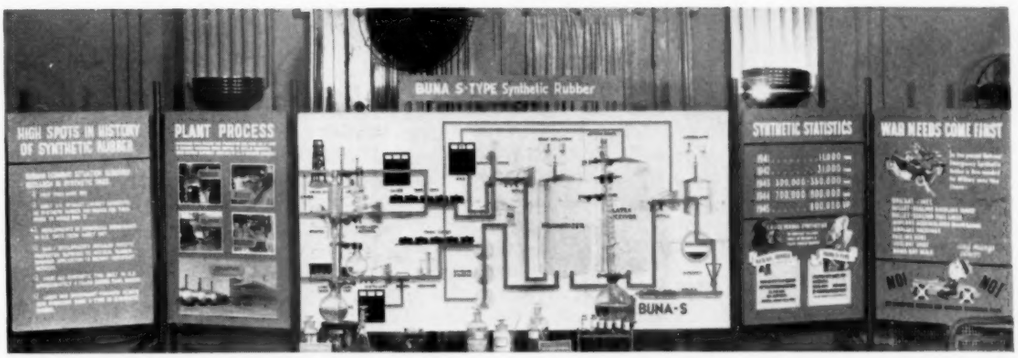
If you asked a question, you got a straight-forward answer.

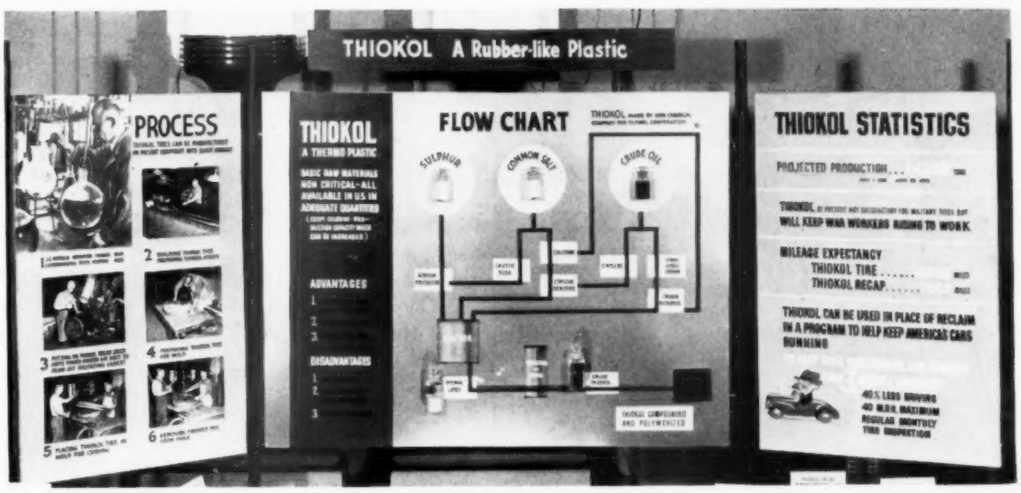
NPN Views Display

Let's see what the thing looked like.

The first booth pictured the gathering of natural rubber, showed a latex cup and the knife that is used to slash the rubber tree's bark.

Just to make it complete, the





Rubber manufacturers unveiled their "tires-for-all" plan along with an elaborate layout of exhibits in the Congressional Room of Washington's Hotel Willard. In top picture is the exhibit on Buna-S type synthetic rubber, which commanded one end of the room. Middle picture shows the Thiokol process, which tire makers hope to use in their proposed program to provide tires for all. Bottom is New Jersey Standard's "Flexon" process, a major link in the rubber industry's plan to keep all cars rolling

Large part of the tire maker's exhibit was given over to the reclaiming process, illustrated with pictures like the one above which shows next to last step in turning scrap rubber into usable rubber. Here, scrap rubber, ground and partially processed, is forced through a screen by a worm screw, removing bits of metal and fiber. The spaghetti-like mass is now ready for the final refining operation

next booth showed other natural rubber sources—guayule which looks like a tumbleweed, Russian dandelion, cryptostegia, and the goldenrod.

Buna-S, "the rubber plantation that grew in a test tube", was depicted by statistical charts and a flow chart that shows how it is made from either oil or grain.

Since reclaimed rubber is an integral part of the plan, pictures showed how scrap rubber is chopped up, macerated, strained to remove impurities, sheeted and turned into blocks.

It was pointed out that a reclaimed tire—made of 17.18 lbs. of reclaimed plus 00.23 lbs. of crude rubber—can give 10,000 miles. An additional 7000 miles is obtainable through recapping which brings the reclaim content to 22.210 lbs. and crude to 00.376.

And 12 lbs. still can be obtained when the tire is scrapped.

The Thiokol exhibit proclaimed that it is made of sulphur, common salt and crude oil.

Its advantages are: (1) resists swelling; (2) resists sunlight; (3) resists oil and organic solvents.

Its disadvantages are: (1) low flex life; (2) takes fixed "set" under distortion; (3) difficult to process.

A tire made entirely of Thiokol can be expected to give 10,000 miles. A recap gives another 7000 miles. A Thiokol recap on a natural rubber tire gives 4400 miles.

Projected production is said to be 14,250 tons between July 1, 1942, and June 30, 1943. It is unsatisfactory for military use, "but will keep war workers riding to work".

Butyl (Flexon) rubber was the next in line. The exhibit said it is better than an all reclaim tire, can provide 12,000 miles at 40 m.p.h.

Flexon first broke upon the public horizon when President W. S. Farish of Standard Oil Co. (N. J.) told a House mines and mining subcommittee that the company is planning "make shift" facilities to make it from iso-butylene.

Plan's Prerequisites

The rest of the exhibit told why the use of substitutes was necessary, that 40% less driving, a 40-mile speed limit and regular monthly tire inspections would be necessary to make the plan a success.

The plan (*NPN cover, July 22*) would provide 13,223,000 new tires made from reclaim, Thiokol or Butyl and 30,291,000 recaps made from the same materials, plus 4,660,000 pre-war tires, which would be made with 97,420 tons of reclaim, 3332 tons of crude rubber, 33,188 tons of Thiokol and 32,475 tons of Butyl. The plan covers a 2-year period.

* * *

'Tires for All' Plan Rouses Several 'Ifs' in Washington

WASHINGTON—Tire industry's plan to provide tires for all cars for next two years "looks pretty good" to government officials, according to reliable information, but they raise several questions about its feasibility.

Briefly, the tire plan contemplates provision of nearly 50,000,000 tires and recaps from now until July 1, 1944, by using reclaimed rubber, Thiokol and Butyl.

And there is where one of the big questions is raised. What happens after 1944?

Sundries Worry Officials

Another thing that seems to be worrying officials if they give the "okay" to the plan is this: Literally hundreds of items accepted as commonplace in the average home where they are used regularly have been cut to the very bone in use of rubber, aside from those cut out completely. So, how will they defend the need for absolute minima in these lines if they give tires to everybody?

Passenger car transportation, of course, is rather essential.

An official well versed in rubber said synthetic rubber is not adapted to military use, and that crude rubber—even the small amount of 3000 tons required by the tire industry's plan—could not be released for civilian use until that is possible.

Another detracting factor, a WPB official said, is the fact that materials difficulties are slowing up the synthetic rubber program materially.

Newhall 'Backs Down'

Open official reaction was marked by Rubber Co-ordinator Newhall who "backed down" on the whole shebang.

Newspaper reporters said they visited Mr. Newhall on the morning of July 22 to hear him make an optimistic statement about tire supply. They asked him to incorporate his remarks in a formal statement.

After a long delay, the statement was issued, saying there were "too many ifs" in the tire plan. Reporters again called on Mr. Newhall. They were told he could not see them.

"We will see him," they said in effect, and settled themselves comfortably for a wait that turned out to be 30 minutes long.

In the meantime, two press agents of the Office of War Information came down to Mr. Newhall's office and told the boys there would be no press conference.

But they saw Mr. Newhall just the same and at the press conference he maintained the position taken in the formal statement.

Sen. Allen J. Ellender, La., construed the tire industry plan as endorsement of his bill to provide 30,000,000 retreads annually for next 3 years.

Because of this, he predicted the "practically unanimous" favorable report by Senate Banking and Currency Committee on the bill.

Cars Essential—Eastman

And the need for passenger car tires was pointed out by ODT Director Eastman who said in a speech at Madison, Wis., on July 21:

"So far as the passenger cars of the country are concerned, the best figures now available indicate that on the average about 50% of their use is for essential purposes. It is doubtful, however, whether as many as 5% of the cars are used wholly for either nonessential or essential purposes. Fully 90% are used for both."

Mr. Newhall reiterated that there is no evidence of rubber for anything but military and most essential civilian purposes.

"In short, there are a great many ifs," he said. "The nub of the situation, as I see it, is this—if we can spare the reclaimed rubber, the crude rubber, the Thiokol, and the Butyl, and if all motorists would engage only in essential driving, and if motorists will cut speeds to 40 miles an hour, and if they take the best care of their tires—then, and only then, could this or any other such plan be adopted."

Rubber industry, he continued, made the study at his request—and did "an immensely interesting job" but left many questions unanswered.

A.A.A. Urges Adoption

The American Automobile Assn. urged the government to speedily consider and approve the tire industry's plan.

A.A.A. said approval of the plan would reassure the motorists and "do much toward calming the public apprehension over tires, an apprehension upon which the confusion over rubber has fed abundantly in recent months."

OPA Warns Ration Violators As New Plan Starts in East

WASHINGTON—A permanent system of rationing gasoline on the East Coast was initiated July 22 to the accompaniment of promises of swift retribution against violators and a crackdown on coupon counterfeiters.

"Careless dealers," Price Administrator Henderson emphasized, "should know that by violating the provisions of the regulations they choose to run the risk of being put out of business."

While the temporary plan was in effect, he said, gasoline supplies were protected by the limitation placed upon service station deliveries, but now rationing is the only wall around our gasoline supplies.

"I say bluntly," he declared, "that the petroleum situation in the east is so desperate that any attempt to violate the rationing system will constitute an assault on a vital war measure and will be dealt with accordingly."

Sticker and Book Must Gibe

Chiselers will be checked upon through the requirement that stickers be displayed on windshields. If motorists are caught with a book higher than that designated by the sticker, they will be punished, he said.

Because of the requirement that dealers obtain inventory coupons on the 22 and 23, Office of Price Administration made arrangements—by telegrams to some 110 or 115 oil companies on the coast—for delivery of gasoline on a credit basis.

Coupon Credit Rules

Under this arrangement, suppliers could deliver gasoline on the 22 and 23 and dealers would not be required to turn in coupons for 24 hours.

A similar privilege was extended to motorists when OPA approved a "coupon credit" system that shall remain in operation until July 31.

Designated to prevent hardship to persons who have not obtained ration books because of a delay in filing applications or because of the last minute rush at ration boards, OPA permitted dealers to sell to a person who has not received his coupon book.

The dealer is required to make a written record of each such transaction with the name and address of the purchaser. Names of purchasers who have not submitted coupons by August 4 are to be turned over to the State OPA office.

Mr. Henderson's warning on counterfeiting came on July 26 and was couched in strong language.

"Gasoline coupon counterfeiters must be prosecuted as rigorously as any saboteurs attacking our war program," he declared.

Reports of counterfeit books are being investigated and "prompt action" will follow in cases where fakes are found.

The coupons, he said, "are secretly marked," and are being tested right along.

But a man in a position to have reliable information—who preferred to remain anonymous—said the coupon system is doomed to about as much success as prohibition", because the coupons are easy to duplicate in that they are not the same size.

He made the charge that counterfeit books already are circulating on the East Coast, following black market activities under the "meal ticket" system which saw the daily sale of 150,000 gal. of illicit gasoline at prices ranging from 30 to 50c per gal.

On the eve of rationing, OPA "officially" set the value of each type of coupon as follows: A, 4 gal.; B, 4; C, 4; D, 1.5; E, 1; R, 5; S-1 and S-2, 5.

Provides for Trucks

OPA made provision for commercial vehicles to obtain gasoline in case there is a delay in issuance of books.

Regulations require that rations for trucks subject to ICC jurisdiction be approved by ODT, but OPA said that in case regular rations can not be issued in time, local boards can issue rations needed until August 15.

Rationing Held Unnecessary To Save Tires for Civilians

WASHINGTON—There is a sufficient supply of rubber to meet the needs of the war effort and essential civilian use, if proper steps are taken to prevent waste, according to conclusions reached by a congressional committee, headed by Rep. Kleberg, Tex., to study the "need" for nationwide gasoline rationing.

Committee was named at a boisterous meeting of 137 congressmen last month, which heard blistering attacks on OPA Chief Henderson and his plans for nationwide gasoline rationing to save rubber.

Now, the committee has reported back, saying that gasoline rationing is not needed except where wartime conditions have disrupted transportation; also, that any rubber shortage should be met by rationing rubber itself, not gasoline.

Tires for Civilians Urged

"Your committee," said the report submitted by Rep. Scrugham, Nev., vice-chairman and secretary, "knowing full well that the economic life of the nation is geared to rubber-tired wheels, is convinced, from the information it has before it, that sufficient reclaimed rubber and the small amount of crude rubber necessary can, and should be, obtained for retreading tires for essential use."

Data in the report was compiled by Rep. Lea, Calif., acting chairman of the Cole oil subcommittee.

Gasoline rationing, except in areas where transportation facilities are temporarily inadequate, according to the congressmen's report, is "unnecessary, unwise and economically unsound."

Other Points Cited

That every effective step be taken to furnish proper transportation of gasoline and oil products to the Eastern rationed area at the earliest possible moment.

That the government bend every energy toward obtaining a rapid and efficient production of synthetic rubber by any and all practical methods.

That additional small plants for the reclaiming of rubber be established with government aid if necessary, throughout the various sections of the country so that every available bit of rubber scrap may be effectively used.

That a portion of such reclaimed rubber, together with the small amount of crude rubber needed, be allocated for the retreading of tires for essential civilian use.

That the government officials refrain from threatening seizure of privately owned tires, and that assurance be given American motorists that they will be permitted to retain, subject to penalties for violation of restrictions on use, five tires for each car.

That legislation be enacted or orders be made effective for the limitation of motor vehicle speed to thirty-five or forty miles per hour with appropriate punishment for excessive speed or other unwarranted waste and misuse of tires and the rubber therein.

Correction

Each page of 8 coupons in the "A" gasoline ration books for the East must be used up in two months, not one month as was stated in NPN July 15.

Final Ban Placed On Metal Oil Can

WASHINGTON — September 30 is the death-day WPB has set for the use, manufacture and sale of lubricating oil cans made of any metal of any kind.

Cans may be manufactured and used until then, but to make sure there will be no large inventory of cans on that date, WPB allows canners to use until then only 10% of the combined area of tinplate, terneplate and blackplate used for the same purpose in 1940.

Inventory Rules Set

Manufacturers may use for 1 qt., 5 qt., and larger lube cans the terneplate they had in inventory before February 11, 1942, but are prohibited from using terneplate sheets not in their possession on February 11.

WPB's death sentence was handed down July 23 in Supplementary Order M-81-b.

Eligibles Reduced

A day earlier, WPB struck another telling blow at cans in general by slicing from the list of eligibles a large number of cans which may use blackplate. The effect of this cut—contained in Conservation Order M-136—is to limit blackplate to a small list of essential products.

Products that are necessary for military and civilian purposes were placed on List A, which means that those cans may be made with an amount of blackplate not exceeding 100% of the combined area of tinplate, terneplate and blackplate used in calendar 1940. The list also limited can sizes.

On this list were dry solvents, 10 oz. cans only; benzol, 1 gal. cans only; graphite; lubricating grease, 10 or 25 lb. cans only.

NPN's *Washington Directory* of Oil Agency Headquarters

Following is a partial list and directory of governmental agencies in Washington dealing with matters affecting the oil industry: (List is as accurate as possible but is only tentative as room and phone numbers are constantly changing.)

Abbreviations code: Rm for room; Ex for phone extension.

Office of Petroleum Co-ordinator

Interior Department (New Building) 18th and C. Sts., N. W., Phone REpublic 1820.

Receptionist
Mrs. Rosalie E. Reid, Rm 6635, Ex 3429-4820.

Co-ordinator
Harold L. Ickes, Rm 6156, Ex 5000.

Deputy Co-ordinator
Ralph K. Davies, Rm 6654, Ex 3831.

Assistant Deputy Co-ordinators
Robert E. Allen, Rm 6647, Ex 4401.
Everett Lee De Golyer, Rm 7514, Ex 4459.
Bruce Brown, Rm 6644, Ex 2066.

Special Assistants
Dr. John W. Frey, Rm 4345, Ex 4272.
Gordon M. Sessions, Rm 7515, Ex 4446.
Howard T. Mather, Rm 6626, Ex 4626.
J. Elmer Thomas, Rm 7442, Ex 4735.
Elmer E. Batzell, priorities allocation, Rm 6070, Ex 2181.

Executive Officer
Stanley W. Crosthwait, Rm 6415, Ex 4363.

WPB Priority Consultant
Robert B. Shirk, chief priority specialist, Rm 7340-42, Ex 4616-17.

Information Division
Herbert A. Yocom, director, Rm 7515, Ex 3844, 4650-3844.

Facility Security Division
W. D. Mason, director, Rm 3641, Ex 4172.

Foreign Division
James T. Duce, Rm 4442-40, Ex 4417-4863.
Wm. D. Crampton, associate director, Rm 4448, Ex 4788.
C. S. Snodgrass, associate director, Rm 4450, Ex 2968.
Walter R. Lange, tanker co-ordinating expert, Tanker Co-ordinating Board, Rm 7512, Ex 4744-4437.

Legal Division
J. Howard Marshall, chief counsel, Rm 6649, Ex 4100.
Robert E. Friedman, associate chief counsel, Rm 6424, Ex 668.
David M. Hudson, associate chief counsel, Rm 6422, Ex 793.
George A. Wilson, principal attorney, Rm 6642, Ex 4898.

Marketing Division
Robert T. Collier, director, Rm 4257, Ex 4646-7.
Paul A. Best, assistant director, Rm 4258, Ex 3518.
Joseph H. Ellender, principal marketing analyst, Rm 4256, Ex 4434.
D. C. Arnold, chief of asphalt section, Rm 4244, Ex 2787.
Ned F. Foulds, chief of fuel oils section, Rm 4257, Ex 4797.
Howard C. Cooper, chief of lube oils and miscellaneous products, Rm 4247, Ex 4313.

Materials Division
Greer W. Orton, director, Rm 7314, Ex 4585.

Natural Gas and Natural Gasoline Division
E. Holley Poe, director, Rm 7423, Ex 4860.
Paul M. Raigorodsky, assistant director, Rm 7423, Ex 4774-2059.
James E. Pew, chief of natural gasoline section, Rm 7424, Ex 4871.
Charles E. Webber, natural gasoline section, Rm 7424, Ex 4871.
Robert W. Ducker, chief of natural gas section, Rm 7426, Ex 2524.
Thomas R. Weymouth, consultant, natural gas section, Rm 7426, Ex 2524.

Petroleum Supply Division
Robert Lee Minckler, director, Rm 7452, Ex 4834.
R. C. Sauer, assistant director, Rm 7450, Ex 2083.

Production Division
Donald R. Knowlton, Rm 7410, Ex 4861.
Ralph J. Schilthuis, assistant director, Rm 7410, Ex 2907-4689.

Refining Division
Wright W. Gary, director, Rm 6637, Ex 3233-4644.
Robert B. Cragin, assistant director, Rm 3218, Ex 3237.
Phillip M. Robinson, assistant director, Rm 6642, Ex 4786-87.
Douglas P. Bailey, chief of operations section, Rm 3213, Ex 4877.
Max B. Miller, chief equipment procurement section, Rm 7443, Ex 4560.
George Parkhurst, chief of facilities section, Rm 3229, Ex 3941-3232.

Research Division
Edward B. Swanson, director, Rm 7315, Ex 649.
Oliver S. Ambrose, assistant director, Rm 7317, Ex 4777.

Division of Reserves
Wm. B. Heroy, director, Rm 7516, Ex 4459.

Transportation Division
Maj. J. R. Parten, director, Rm 6629, Ex 4418-3329.
W. C. Kinsolving, associate director, Rm 6629, Ex 3557.
Lee R. Cowles, assistant director, Rm 6620, Ex 3658.
Donald A. Sears, chief of pipeline section, Rm 6624, Ex 4833.
Boyd Wilson, chief of rail transportation section, Rm 6623, Ex 4620.
S. D. Archbold, chief of inland waterways section, Rm 6622, Ex 4333.
Arch Turner, chief of motor transportation section, Rm 6619, Ex 4300.

Liaison
Gen. Walter B. Pyron
Liaison agent between Army Department and OPC, Phone RE 6700, Ex 6044, Rm 3062, Munitions Bldg., Constitution Ave. between 19th and 21st Sts.

War Production Board

Petroleum Machinery section, Special Industry Machinery Branch—Temporary Bldg. E, 5th Wing—Third Floor, Phone REpublic 7500, Ex 3441.
A. E. Collins, chief, Ex 5741.
John W. Choates, refinery equipment, Ex 72615.
William L. Clark, production machinery, Ex 72615.
E. B. Miller, production and refining equipment, Ex 5751.
M. A. Willner, production and transportation, Ex 72615.

Oil Section—New Social Security Bldg., Rm 4613, Phone REpublic 7500.
Dr. Walter Whitman, petroleum consultant, Rm 3082, Railroad Retirement Bldg., 4th & C St., S. W., Ex 6310.
C. C. Monrad, assistant, Rm 3090 Railroad Retirement Bldg., 4th & C St., SW., Ex 2983.

Rubber Co-ordinator
Arthur B. Newhall, Rm 2300, Ex 4698.

Liaison, WPB-OPC-RFC
R. Otis McClintock, Rm 5193 A, Ex 71181.

Office of Price Administration

Temporary D Bldg., 4th and Independence Ave., Phone REpublic 7500.
Leon Henderson, administrator, Rm 46, Ex 5586.
Dr. J. K. Galbraith, staff deputy administrator, Rm 5131-B (Census Bldg., 2nd & D St., S. W.), Ex 5203.
Dr. George W. Stocking, assistant administrator, fuel division, Rm 245, Ex 72519.
Page Keeton, chief counsel, fuel division, Rm 1604, Ex 6359.
Michael Soel, administrative officer petroleum section, Rm 236, Ex 5389.
George Doffing, price executive of petroleum section, Rm 236, Ex 5388.
Joseph H. Salmon, associate price executive, Rm 2530, Ex 6376.
Robert Collacott, head of refined products unit, Rm 2705, Ex 3636.
Edward W. Doherty, chief, economic analysis unit, Rm 2721, Ex 6370.
Peter Jensen, business specialist on lubes, fuel oils, asphalt, Rm 2709, Ex 4916.
Leo Van Herpe, chief of fuel section accounting division, Rm 2215, Ex 5539.
Watson B. Joyes, consultant in crude oil unit, Rm 2717, Ex 4403.
Joel Dean, handling gasoline rationing plans, Rm 254, Ex 73411.

U. S. Tariff Commission

7th and F st., N. W., Phone NAtional 3947.

Petroleum Accounting Section
Kenneth L. Stone, chief, Rm 155, Ex 123.

Office of Defense Transportation

Interstate Commerce Commission Bldg., Constitution Ave. & 78th St., N. W. Phone REpublic 7500.
Joseph B. Eastman, director, Rm 5136, Ex 3527.
Fayette B. Dow, assistant on pipelines, tank cars, tankers and trucks, Rm 5132, Ex 73207.
J. G. Scott, counsel, Rm 5418, Ex 2460.

Motor Transport Division
John L. Rogers, director, Rm 4211, Ex 2297.
Sam F. Niness, chief of petroleum carrier section, Rm 4221, Labor Bldg., Ex 6351.
V. T. Cumming, chief of vehicle maintenance section, Rm 4215, Labor Bldg., Ex 72731.
T. L. Preble, consultant, vehicle maintenance section, Rm 4215, Labor Bldg., Ex 72775.
R. D. Thomas, chief of tire maintenance section, Rm 4209, Labor Bldg., Ex 71446.
H. H. Kelly, chief of allocation and materials section, Rm 4311 (Labor), Ex 73027.
Leon F. Banigan, assistant to Kelly, Rm 4311, Labor Bldg., Ex 73027.

Congress

Congressional Oil Investigating Committee
Rep. Wm. J. Cole Jr., chairman, New House Office Bldg., Rm 1535, Ex 699.

Senate Oil Shortage Investigating Committee
Sen. Francis Maloney, chairman, Senate Office Bldg., Room 354, Ex 1196, Phone NAtional 3120.

Petroleum Industry War Council

William R. Boyd, Jr., chairman, Rm 919, Commonwealth Bldg., 1625 K St., N.W. Phone DIstrict 2820. Allan H. Hand, secretary-treasurer.

U. S. Maritime Commission

Commerce Department, Phone REpublic 6620.
B. B. Jennings, director of tanker operations, War Shipping Administration, Rm 4309, Ex 87, 88, 89.

OIL IS AMMUNITION USE IT WISELY !

The EDITOR'S Page

Readers comments and opinions will be much appreciated by—WARREN C. PLATT, NPN's Editor and publisher, Penton Building, Cleveland, O.

Join the U.S. TRUCK CONSERVATION CORPS

Congress Has Shed Needed Light on Rubber, But it Should Not Make Technical Decisions

CONGRESS, with its investigating powers, is doing a highly necessary job in stirring up the war agencies, particularly those having to do with rubber. The "stirring up" is not always very skilfully done, nor is it always considerate of the rights of the agencies or of the witnesses, nor are the reports always as clear as they might be nor as fair to all concerned.

But despite the faults of this procedure of democracy, which is essential to the protection of democracy, much good is coming from this "stirring up".

Take the results in the rubber situation. We find that the administration is halted in its headlong plunge to national gasoline rationing, on the coming of Congressional investigations. WPB re-reviewed the new Houdry process. More facts developed as to the great progress the Standard of New Jersey has made in its several processes. There came more facts about the rapid development by the oil industry and the refinery division of OPC, of a short-cut to butadiene with existing refinery equipment. And now we have Chairman Nelson of WPB taking personal charge of rubber.

In all this Congress did just what Congress is supposed to do—shake up the machinery of government and bring some of its faults out in the open.

But now Congress has reached into the intricacies of our war effort and made a decision as to the relative merits of two highly technical methods of making rubber. The question is not just one of great chemical importance and calling for an excellent knowledge of hydrocarbon chemistry, but it also calls for the best of engineering knowledge as to plant construction, metals required, etc.; also it calls for inside knowledge of the war plans of this country and their exact status today.

Regardless of all these complexities, both houses of Congress with practically no debate have made an absolute decision that the rubber problem, and all the metals and materials it requires, shall be taken from WPB and given to a separate rubber agency which agency it instructs to adopt the farm-produce alcohol-to-buttadiene method of producing rubber. WPB can still go the petroleum-to-butadiene route, if it wishes, but this new agency must hurry down the farm-produce route regardless.

One doubts if there are any men in Congress who are qualified by their chemical, engineering and military knowledge to make such a decision. Certainly none of the members of the several committees this writer has recently seen perform and whose hearings he has read showed any such expert knowledge.

One of the business or scientific men involved directly in the various rubber-making methods, so far as we know, have asked Congress to make any such decision. The decision was quite palpably made by the "farm bloc" in Congress and quite obviously to get the votes of the farmers at this fall's elections. So far as the protestants to the various decisions WPB and other agencies had made as regards rubber, we believe they were content to wait on the results of the Congressional "stirring up" in the expectation that probably sufficient changes have or will be made in personnel, and in men's minds, so as to produce better and fairer decisions.

THE job of Congress and the job of the president is to create and supervise the proper machinery for conducting the war and not to take over any of the detailed functions of that machinery.

The President should, all business men will agree, veto this enactment for a new rubber agency. In that veto message he could well advise and even urge Congress to keep its official eye on the war machinery to hunt for weak spots and to let him know as soon as it finds one, the while he assures the public that he will devote all his time to perfecting the war machinery rather than to usurp any of its functions himself.

The President is said to be considering naming a committee of leading scientists and engineers to determine what processes shall be used for making rubber and what shall be done about processes now under construction. Such a committee certainly should be able to make decisions that will carry more weight with the general public and have a far better chance of being the correct decisions than can decisions made by a Congress on the eve of its own election.

IN THE meantime the oil industry, as well as the people of the country, can thank Congress for the investigating work it has done, for bringing to light facts that would still be hidden, for halting various officials in their limited viewing of the rubber question. In fact, we can thank Congress, probably, for a "stirring up" which will head-off the seizure of tires while the oil and rubber and chemical industries of the country proceed with old and new plans to the making of brand new supplies of rubber in such quantity and of such quality as promise to keep all cars and trucks fairly reasonably equipped with passable rubber for the duration.

Bureaucracy, and the military arms of government, naturally reach for all the power they can when they are in the ascendancy as in a war. These forces of government also tend to shield their own thoughts and actions more and more from public view. They invite no inquiries and they repell all criticisms and even suggestions.

These agencies can do these things against the people only as long as Congress, which has all the power, lets them. In the past few months, particularly, Congress has more and more shown its inclination and willingness to make these agencies and military authorities come before it and report what they are doing in increasing detail.

The country's safety and progress lies in the extent, in the intelligence and in the courage of these Congressional inquiries.

OPA Euchres Eastern Oil Men And Then Moves Out Trojan Horses

"OPAer" Henderson, his supporters and many news writers, hail his price fixing efforts as a "battle against inflation" and speak of the recent belated increase in price of petroleum in the East as a "piercing of the price ceiling".

As to the first contention, that Henderson is to "battle against inflation", that is granted. According to the presidential letter of appointment in the first place and the Congressional enactment this winter in the second, Henderson was to prevent speculative and inflationary prices.

However, whether Henderson has always battled against inflation or just tried to change this country's economic set-up by his own fiat prices, it now appears many victims are willing to debate, including the oil industry. OPA and Henderson have issued price ceilings and have since loudly proclaimed that they for the most part, are sacred and any elevation of them is "inflation".

It was this flat official statement that has gotten Henderson into trouble. There was no retreat from it but to "inflation". Had Henderson and his associates tempered and qualified this one-price-or-die platform, if they had invited the victims in to help get fair prices, if they had kept their weather eyes alert for truly inflationary prices and not just

profitable prices (from which excess profits taxes would be generously paid) and if the Administration had cracked down on the inflationary efforts of the labor union bosses and professional farm bloc promoters, Henderson could have made changes in his price levels as a sound business structure warranted without losing face.

HENDERSON and his associates have tried to bully the oil industry into accepting his price levels—and they were generally unfair and even illegal—by crying that any increases would be "inflation".

Henderson and his professorial and economisitic associates know that raising oil prices to take care of increased transportation cost is not "inflation" nor anything remotely like "inflation". Henderson and his crowd also know that any natural increases to compensate oil marketers for the higher costs of their restricted volume of business is not in the slightest "inflation".

Henderson and his associates have all been to college and they can read, so they know the law creating their jobs specifically requires that they recognize increases in transportation costs and general increases in business costs.

The pity of it is that the oil companies did not stand their ground at the start of the East Coast shortage and insist that they would collect for the extra land transportation as it fell on each customer. They could have advertised this to the customers, and explained that many of these same customers not so many years ago were paying high land transportation costs and that now they were being asked to return to their old status because of the submarine sinking and the Navy diverting tankers.

The increased cost per year to motorists at the furthest East Coast points would not have been $20. It is not conceivable that in these prosperous days for most motorists that, with full explanations, they would have opposed paying that slight increase in the cost of operating their cars? Home owners, too, would have paid similar small increases for the benefit of the premium warmth, handiness and cleanliness of oil heat.

Politicians might have tried stirring up the voters but they would be bucking the fact that the maximum increase would apply to but the furthest fringe of residents of northern Atlantic coast points.

OPA has rather euchered the oil men into a tight spot, by first getting nearly $40,000,000 of their money into the pocketbooks of the customers, and then making all motorists and home owners extremely conscious of the situation by inflicting on all, as far back as Ohio, a 2.7c increase on gasoline alone.

Had the oil industry been left alone by government it would have collected a maximum increase from only a small percentage of the "down easterners" and from the rest of the motorists of the area the industry would have taken decreasing amounts down to no increases or but a fraction of a cent for probably the western half of New York, Pennsylvania and Virginia and very little from the southeastern states.

But government reached in and by stopping the natural processes of business held up the collection of the small amounts until they became large ones and then government insisted that a large increase be slapped on as many motorists and home owners as possible. Along with this action came loud statements from government officials et al about the "battle against inflation" and keeping "price ceilings from being pierced".

Government, after forcing the motorists and home owners of the East into millions of dollars of debt to the oil industry without telling them so, jumped to the fore as the doughty champion of the people against "inflation".

It is as colossal a piece of political chicanery as this country has seen in years.

It was nothing but a maneuver of the boys at Washington who want to control things—and particularly the oil industry—following their main objective and grabbing the control of the marketing of petroleum, for with the East under such government control it follows that government must use its powers "to save" the rest of the country.

All this has nothing whatsoever to do with war or with real "inflation". To say that it has is just to distort the plain truth.

AFTER the industry had floundered around with a gigantic "pool" of transportation and excess prices, only the excess was not enough to liquidate the "pool", there was at last trotted out what looked like a Trojan horse—a tremendous government petroleum corporation that would allegedly, buy the land-transported petroleum at the "high" price and sell it to the distributors at a "low" price with the taxpayer pocketing the loss.

That may have sounded rather well to some people but just imagine what a juicy political project that would have been with Uncle Sam playing Santa Claus, not to the oil industry as a single unit, but to each refiner an distributor in the industry, for all deals would have been individually made?

And what a grand opportunity it would have been for the "experts" in government to have figured new ways of cutting (?) refinery costs and making the prices they paid the refiners fit their conception of "cost saving?"

And what a fine chance to dictate to the distributors of petroleum on how to "cut costs" by fixing the price the distributor would have had to pay, for the tendency always would have been to see that this government petroleum company was something of a "success" an did not lose too much money or perhaps even made a penny or two.

Now there is a dicker on for the RFC to play Santa Claus and pay the transportation deficits, or excess, of the companies.

It was also suggested that a national pot be collected from all consumers in the form of federal taxes on petroleum products. With the oil industry—if it had—imploring Congress to raise such taxes it would have been but natural for Congress to have added some more for its own ends.

PERHAPS the most practical and simple way would be for the government to pay off the "pool" and then let the industry name its own prices and see what higher prices will do toward getting still more petroleum "down East" this fall and winter. However, maybe the "pool" can figure out how to recoup its advances to the motorist for higher freight out of higher prices alone and still not lose enough gallonage to invading competition to hurt?

Certainly the present experience with OPA as a fixer of oil prices does not warrant any assumption that government can name fair prices that will meet all the transportation and competitive conditions in a multitude of towns all over the country.

The only way the oil industry has a chance of getting out from under the heavy and tyrannical hand of government is to keep hammering away, and before the public, at the government's socialistic effort to operate the oil industry under the false excuse of avoiding "inflation" and to "carry on the war effort".

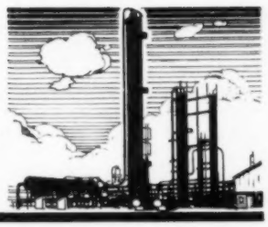
If the government continues to operate the industry in the East, it is only a question of time when its price requirements in the rest of the country will be still more drastic and reforming in order, presumably, to make YOUR company "more socially desirable".

Maybe Rubber was Misfigured Too?

NOW that the government has found that it is making too much of "this and that" (description not given) because it did not figure its manufacturing requirements correctly against its military program, perhaps WPB can refigure the present estimates of rubber requirements and discover that other mistakes have been made?

Maybe with what the oil industry can make and the COMPLETED tanks and trucks and aircraft that can be turned out within a given time, there will be enough rubber to take care of all reasonable civilian uses comfortably?

The public, we believe, knows that mistakes of this sort are quite likely in a program of the size of this war, but the car and truck owners might well feel that these all-seeing minds at Washington might make some allowance for such possible errors in their original figures and not be quite so sadistic about doing things to the public.



Butylene Supplies Ample for Rubber, 100-Octane—Farish

NPN News Bureau

WASHINGTON — Jersey Standard's process is such that it will have "ample" butylene for 45,000 tons of butadiene annually, President W. S. Farish said during another appearance before the Gillette "alky-rubber" committee on July 28.

"This," he said, "is all the Rubber Reserve Co. wanted us to make. We can make more, and we offered to make more, without interfering with our commitments to the government on 100-octane aviation gasoline."

E. V. Murphree, of the Bayway laboratory of Standard Oil Development Co., told the Gillette committee that the Jersey company could produce enough butylene needed for its synthetic rubber program without affecting 100-octane output.

Denying that his company champions any particular process in the synthetic rubber picture, Mr. Farish said he "believes in any program" that will provide synthetic rubber quickly —whether from oil, grain or coal.

"Our whole business is based upon the theory that millions of automobiles can be kept rolling billions of miles," he pointed out.

Gives Comparison

The Jersey president said only $22,300,000 worth of refinery gases would be needed for 410,000 tons of butadiene and some of the raw material needed for styrene, compared with $81,900,000 worth of grain that would be necessary for production of 210,000 tons of butadiene.

Jersey Standard is producing 8.5 tons a day of butadiene in a plant which was completed the first of the year and will be expanded to 13 or 14 tons a day by October. Another plant of the same design—with a daily capacity of 30 tons—will be completed by November, Mr. Farish said.

Two other plants, with a total capacity of 45,000 tons a year, will be completed by next March, using a different process altogether, he added.

Butyl Output to be Hiked 70,000 Tons

WASHINGTON — Formal announcement of a 70,000 ton increase in Butyl rubber's part in the synthetic rubber program came from WPB July 27, thus raising the total program from 800,000 to 870,000 tons yearly.

NPN News Bureau

NEW YORK — War Production Board has approved in principle an extension of over 100% in the Butyl rubber capacity of plants now under construction by Louisiana Standard and Humble Oil & Refining Co., President W. S. Farish of Standard Oil Co. (N. J.) told a press conference July 23.

Improvements in Butyl manufacture, enabling modification of design to increase capacity without delaying plant completions, brought about the tentatively authorized increase, Mr. Farish explained.

Originally, five plants being built by Louisiana Standard and Humble were to have an annual capacity of 60,000 tons. Improvements in manufacture made it possible to raise the capacity to 192,000 tons at an estimated additional investment of 27%, but without increased use of construction materials, according to Mr. Farish. However, as the plan now stands, one of the projects will be cancelled and capacity of the remaining four will be raised to 132,000 tons a year.

"At the same time," Mr. Farish said, "the raw material (iso-butylene) preparation capacity is raised from 60,000 to 90,000 tons per year."

Improvement Cited

It was explained that the change in Butyl manufacturing process involves introduction of carbon black into the mixture of raw materials. Previously, the raw material mixture was cooled to about minus 150 deg. F., and then treated with a catalyst. About 20% or less was converted into rubber and the remainder had to be recycled. But the addition of carbon black, acting as a "blotter", permits recovery of about 3 times as much rubber without recycling. This has reduced recycle so substantially that only one-third the original amount of recycle equipment will be needed.

Discover Process For Quick Output Of Ethyl Benzene

(*Continued from page* 3)

portion of ethylene remaining accomplishes complete conversion into ethyl benzene.

Plant in Operation

Atlantic is already operating a semi-commercial pilot plant successfully and a full scale unit soon is to be put into operation, Mr. Colley disclosed.

At present, technical information on this process is in the hands of refiners known to have catalytic polymerization or other suitable equipment. They have been requested to study the process and report to the technical advisory subcommittee of the Petroleum Industry War Council's synthetic rubber committee on the volume of ethyl benzene they could turn out in their plants. They have also been requested to advise whether the process could be applied to existing equipment or whether additional equipment would be required, what operations are presently being performed with existing equipment and what future plans are for utilizing it. Reports are to be submitted to OPC's Refining Director Wright W. Gary.

Difficulties which became apparent in the use of ethylene as the intermediate in the manufacture of styrene—including the requirement of critical materials for new plant construction in addition to handling difficulties and others mentioned earlier—were responsible for the study by Atlantic engineers and others which lead to the discovery of the new ethyl benzene process, Mr. Colley explained.

Handed to P.I.W.C.

The problem was handed to P.I.W.C.'s technical synthetic rubber subcommittee, and studies were begun in research departments of various companies.

Apparently, the only drawback to the Atlantic process is cost. "Cost of manufacturing rubber using the new method is estimated to be about 5% higher than earlier processes," Mr. Colley said. He added, however, that advantages which would make possible a speeding up of the whole synthetic rubber program would outweigh the cost factor.

Atlantic has offered the process to the government for incorporation in the rubber program and has advised Rubber Reserve Co. that it is ready to grant royalty-free license on patents that may be issued to any manufacturer desiring to utilize the process, Mr. Colley said.

'Hardwood' Process For Making Rubber Revealed at Probe

NPN News Bureau

WASHINGTON—Yearly total of 100,000 tons of synthetic rubber from hardwood could be produced if James J. Earshen, Buffalo, N. Y., inventor of process, could find a sympathetic ear in Washington for the loan of $300,000, plus needed priorities, according to Rep. Holmes, Mass. He made this statement July 27 before special House Committee on its first day of hearings on synthetic rubber, gasoline and fuel oil. Tires can be made from this rubber, Rep. Holmes asserted, and process calls for "not an ounce" of crude rubber.

Displaying a sample of the wood-rubber, the congressman said Earshen's process could be producing in 5 months if the inventor had necessary money and priorities. Cost per pound is estimated between 12 and 15c.

Commentator Testifies

Appearing as first witness, Fulton Lewis, Jr., radio commentator, said Stanley T. Crossland, vice-president of Rubber Reserve Co. "is the Rubber Reserve Co". and charged him with being a "bottleneck—a very sincere intentioned one" in entire synthetic rubber program. Mr. Crossland is an able accountant, not a technician, Mr. Lewis said.

Rep. Fitzgerald, Conn., is chairman of the special House Committee. Other members: Lane, and Holmes, Mass., Forand and Fogarty, R. I.; Wene, and Hartley, N. J.; Pheiffer, N. Y.; Mrs. Smith, Me.; and Talbot, Conn.

Await White House Decision As 'Alky-Rubber' Bill Passes

NPN News Bureau

WASHINGTON — If President Roosevelt signs S.-2600, providing for establishment of a "Rubber Supply Agency" to handle manufacture of alcohol from farm and forest products, it may appear that he is endorsing criticism of WPB's Donald Nelson by taking some jurisdiction over the synthetic rubber program out of Mr. Nelson's hands.

Washington dopesters see this as a tough question for the President, as it's agreed that he can hardly thwart the wishes of Congress on so vital a question in an election year. But, neither can he afford to offend the WPB chief.

In fact, it wouldn't surprise some to see the war production chief named director of this new rubber agency—that is, if the Senate approves. Rep. Anton J. Johnson, Illinois, told the House

"It has been intimated that we might offend Mr. Donald Nelson by passing this bill, but I would welcome his being made the director of this program. I would not be afraid of it under Donald Nelson. I have that much confidence in him."

Terms of the bill, as passed by both houses, provide for a director at a $10,000 yearly salary. However, should Mr. Nelson be appointed, it's assumed the $10,000 salary would be waived. One holdback to the job going to Mr. Nelson might be the bill's provision that the director "shall have no other vocation or employment."

Director's Powers

The director is empowered:

"(1) To make loans or advances, on such terms and conditions and with such maturities as he may determine for the purpose of aiding in or providing facilities for the production and processing of rubber and for the production of alcohol for military or civilian use;

"(2) To purchase, lease, or otherwise acquire such land and to purchase, lease, construct, or otherwise acquire such plants, equipment, facilities, machinery, materials, and supplies as may be necessary for the production and processing of rubber and alcohol (including experiments relating thereto), and other materials needed for such production and processing;

"(3) To provide, by contract or otherwise, for the utilization or operation of such land, plants, equipment, facilities, machinery, materials and supplies for the production and processing of rubber and such other materials;

"(4) To enter into such contracts and agreements as May be necessary or appropriate for carrying out his powers and duties. The Director is specifically authorized in his discretion to enter into contracts with non-profit corporations and co-operative organizations; and

"(5) The Director is authorized and directed to establish within the agency a research staff which shall conduct reseach and experimentation for the purpose of furthering the technical development of synthetic and artificial rubber from agricultural or forest products, utilizing insofar as is practicable, the facilities and services of the Department of Agriculture and the Bureau of Standards."

Would Assure Materials

The section of this bill that might cause more "fireworks" at WPB than any other, reads:

"When and if the Director finds that any article or materials with respect to which priorities are in effect under any regulation or order of the War Production Board, or any other agency of the Government is needed for the purpose of this act, he shall certify such fact to such Board, or other agency, and such Board or other agency shall provide that delivery of such article or material for use for the purposes of this act shall have priority over all deliveries of similar article of materials for private account."

To prevent "monopolistic control", no company is allowed to control more than 10% of the total amount of "alky" rubber to be manufactured or more than 10% of the materials from which such rubber is manufactured.

Refinery Operations

(American Petroleum Institute figures in barrels of 42 gallons. Figures are U. S. totals and are on a Bureau of Mines basis. Breakdown by districts will be published in Aug. 5 NPN.)

	Week Ended July 25, '42	Week Ended July 18, '42	Week Ended July 26, '41
Crude runs to stills (Da. avg.)	3,658,000	3,582,000	3,932,000
Gasoline production at refineries including natural blended	10,864,000	10,963,000	12,903,000
Finished & Unfinished gasoline stocks	82,281,000	84,069,000	85,073,000
Gas oil & distillate stocks	35,966,000	35,176,000	42,126,000
Residual fuel oil stocks	77,816,000	77,230,000	91,466,000

Months in Which Synthetic Rubber Plants Will be Completed

Reported to Congress July 17, 1942
by Rubber Reserve Company.
(Figures are the rated capacity in tons per year)

1942—	No. of Plants	Butadiene From Oil	Butadiene From Alcohol	Butadiene Total	Butyl	Neoprene
Sept.	2	6,200	5,000	11,200		
Oct.	1					10,000
Nov.	2	12,000		12,000	7,000	
	5	18,200	5,000	23,200	7,000	10,000
1943—						
Jan.	2	25,000	20,000	45,000		
Feb.	1		20,000	20,000		
Mar.	4	30,000	20,000			
		30,000				
		15,000				
		75,000	20,000	95,000		
Apr.	4	50,000	20,000			
			20,000			
		50,000	40,000	90,000		10,000
May	2		20,000			
			20,000			
			40,000	40,000		
June	4	50,000	20,000			
		50,000	20,000			
		100,000	40,000	140,000		
July	3		20,000	20,000	33,000	
					20,000	
					53,000	
Aug.	3	50,000				
		20,000				
		55,000				
		125,000		125,000		
Oct.	2	50,000		50,000		20,000
	25	425,000	200,000	625,000	53,000	30,000
Grand Total from Today	30	443,200	205,000	648,000	60,000	40,000

In addition to the foregoing named plants,—

A 1700 ton Thiokol plant will be in operation "in the next few days" by Dow Chemical Co., Charles F. Kettering of General Motors, told the Senate Banking Committee last week;

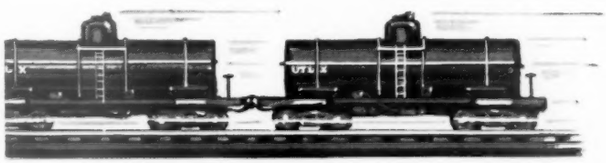
President Farish of Standard of New Jersey also said last week that the Butyl plants being built by Standard of Louisiana and Humble to be completed and in above table, one for 7000 in November of this year and the others in July, 1943, would be increased from 60,000 tons capacity to 132,000 tons.

This brings the total capacity of above rubber material plants to 821,700 tons a year and all except 70,000 tons of this will be finished a year from this August.

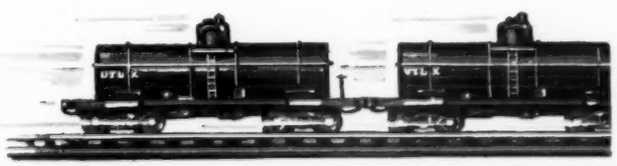
The above does not include the "quick" butadiene the refiners expect to make by remodeling old plants and for which no specific estimate has been given but it may run to 200,000 tons a year or more.

Nor does the above include the Flexon type rubber of which the Standard of New Jersey expects to be making at the rate of 15,000 to 30,000 tons a year by the end of this year.

Don't Let a Single Tank Car Crumble,
Rush Repairs and Make It Rumble



● *Published in the interest of speeding the dispatch of all Tank Cars to aid the war program.*



UNION TANK CAR COMPANY ★ ***Chicago***

Phillips Corrects Incorrect Reports Of Role in Rubber

NPN News Bureau

WASHINGTON—Frank Phillips, board chairman of Phillips Petroleum Co., has issued here a statement to correct "erroneous statements" regarding his company's participation in the synthetic rubber program. Mr. Phillips said these erroneous statements included the report that his company's contract for a butadiene plant had been cancelled and also inaccurate figures on materials required for this plant. He also refuted the charge made recently that no oil company had yet developed a process for making synthetic rubber out of petroleum.

Text of Mr. Phillips' statement follows:

"The affairs of this company and its connection with the synthetic rubber program have been widely publicized during the last few weeks in the public press and in the Congressional Record. Unfortunately, many erroneous statements have been made, consequently in fairness to the company I feel compelled to issue a statement solely for the purpose of correcting these statements.

"The erroneous statement has been made that the War Production Board has cancelled a contract with Phillips Petroleum Co. to design, construct and operate a plant for the government to manufacture butadiene, a product used in the manufacture of synthetic rubber, because of the excessive amount of material required.

"This company has a contract with Defense Plant Corp. and Rubber Reserve Co. to design, construct and operate a plant for the manufacture of 45,000 tons of butadiene per year. The War Production Board has issued the highest preference rating for the procurement of the necessary material. The contract has not been cancelled by Defense Plant Corp. nor has the priority rating been cancelled by the War Production Board.

"The Rubber Reserve Co. has asked that we withhold further purchases and give consideration to every possible means of reducing the amount of critical metals required for our project. It also asked that we investigate the Houdry process. These requests have been complied with.

"Many conflicting statements have been made quoting the amount of new critical material required to construct our plant. According to the Congressional Record of July 21, 1942, our material requirements were quoted as being 113,000 tons. An accurate material list could not be filed until design of the plant had been completed and it was not filed with Defense Plant Corp. until July 18, 1942. The latest estimated requirement of new metals necessary to construct the butadiene plant alone is 11,159 tons. Utilities and service facilities to supply the plant require 2,306 tons or a total of 13,465 tons of new critical metals. This material requirement compares favorably with other butadiene projects.

"The statement has been made that no petroleum company has yet perfected a process for the manufacture of synthetic rubber from petroleum. Phillips Petroleum Co. has been manufacturing butadiene for two years. Its process patents are 100% American and have long since passed the experimental stage. During the past two years Phillips Petroleum Co. has been actually making synthetic rubber through operation of the Hycar Chemical Co. which is jointly owned by Phillips Petroleum Co. and The B. F. Goodrich Co. These plants are privately owned, they do not belong to the government. The capacity of this rubber plant is in excess of 8000 tons per year. Automobile tires made from this plant's production of synthetic rubber are now on the highways. A large portion of the affiliate company's production of synthetic rubber is now being used in the manufacture of leak-proof gasoline tanks for military aircraft.

"Shortly after the Japanese raid on Pearl Harbor, Defense Plant Corp. and Rubber Reserve Co. asked officials of Phillips Petroleum Co. to come to Washington to discuss a synthetic rubber program. Even before a contract was signed the Phillips Petroleum Co. as directed, immediately started the design and construction of a butadiene plant.

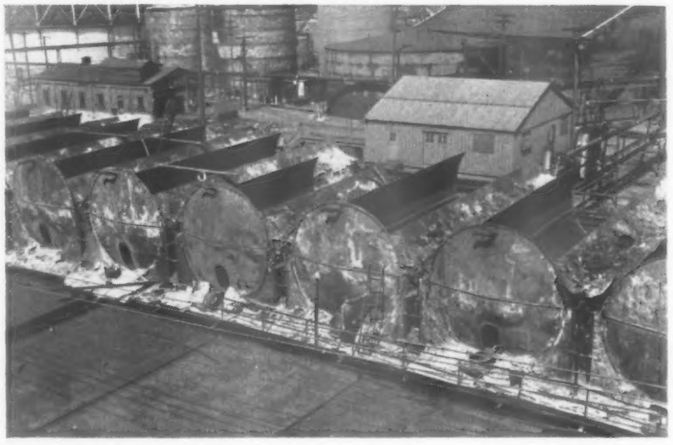
"Six months work has already been done. More than 150,000 man hours of engineers, chemists, and other trained technicians have been devoted to this work. Approximately $12,000,000 worth of material has been ordered. The plant is scheduled for completion April 1, 1943, simultaneously with the completion of a styrene plant and a synthetic rubber plant at the same location, comprising a complete production synthetic unit. Within less than eight and one-half months from today these plants if completed on present schedules will be producing 50,000 long tons of synthetic rubber per year. This annual production of rubber is enough to make 11,000,000 automobile tires to relieve the nation's critical shortage of rubber."

New Jersey 'Gas' Use Drops

Special to NPN

TRENTON—Total April motor fuel consumption in New Jersey was 69,743,233 gal. as compared with 78,142,062 gal. in March.

Atlantic Asphalt Plant Joins Scrap Pile



Demolition of an old asphalt plant by Atlantic Refining at its Point Breeze refinery will add 1000 tons of scrap to the nation's scrap pile. Part of the job is already done, with tops from this bank of stills. Eventually, the entire unit, which was built in 1916, will be ready for re-use as new steel. H. M. Nichols, refinery manager, is directing the work

WPB Held Ready To 'Requisition' Metal for Scrap

NPN News Bureau

WASHINGTON—War Production Board is prepared to rely upon its requisitioning power to bring in the 17,000,000 tons of iron and steel scrap which it has set as the goal for the national salvage program.

Reliable information is that industrial concerns will have to prove that they need equipment which has been idle for some time, or WPB will force them to scrap it.

WPB appears determined to avert the scrap shortage that last winter forced about 40 furnaces to cease operations.

A high source explained the difference between the industrial salvage and the automotive safety foundation in the scrap drive so far as the oil industry is concerned.

The organization set up by the safety foundation, it was said, will be responsible for acting as scrap collection depots—including service stations—for entire areas.

But the collection within the oil industry remains in the hands of WPB's industrial salvage section, an official said.

To Operate 100-Octane Unit

NPN News Bureau

CLEVELAND—National Refining Co. has announced it will operate a 100-octane aviation gasoline plant to be built by Defense Plant Corp. at Coffeyville, Kans. Details as to capacity and construction schedules are withheld because of censorship regulations.

Indiana Standard Refinery Sets Safety Record

NPN News Bureau

CHICAGO—A new world's safety record for the petroleum industry has been set by the more than 1000 employes of the Wood River, Ill., refinery of Indiana Standard, S.A. Montgomery, manager at Wood River, announces.

The record is 6,850,000 man hours of work without loss of time or disabling injury because of accident.

Date, Place of Chemical Expo Changed by Chicago A. C. S.

NPN News Bureau

CHICAGO—American Chemical Society's Chicago Section has changed date and location for its second National Chemical Exposition. The new location is the Sherman Hotel and the new date is Nov. 24-29.

The expo was previously scheduled for one week earlier and was to be held in the Stevens Hotel. Acquisition of the Stevens by the Army brought about the change.

Power and Engineering Expo To Be Held in New York

NPN News Bureau

NEW YORK—The 15th National Exposition of Power and Mechanical Engineering will be held at Central Palace, New York City, Nov. 30 to Dec. 5. It is being planned as an aid to war production and will be of interest to engineers and operating men who are faced with many new production and maintenance problems. The management announces that 170 spaces have already been engaged for displays.

The life of a "Major" *isn't All Gravy*

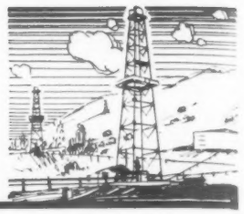
IF you've ever traced the workings of a large oil company, then you know there's more to its operation than paying dividends.

To cite a few examples: 5,020 oil and gas wells, 33 water terminals and 1,197 bulk depots must be operated and maintained continuously by the Shell Oil Company. Nearly $12,173,600 has been spent in the past year on maintenance and repairs alone. Yet new wells must continue to be drilled, equipment maintained, new products developed, so that Shell may continue to furnish you with products you can sell with utmost confidence. Products which help you make more money.

SHELL OIL COMPANY
INCORPORATED

OIL IS *Ammunition* - USE IT WISELY
SHELL

PRODUCTION NEWS



Morgenthau Again Attacks Oil's Depletion Allowance

NPN News Bureau

WASHINGTON — Treasury Secretary Morgenthau has launched another attack on the depletion allowance, declaring "we cannot justify this exemption (from tax) on the ground that it encourages exploration and drilling for oil."

He has told the Senate finance committee, considering the new tax bill, that oil well depletion allowances cost the government $200,000,000 a year and that every wildcat well drilled in 1941 could have been financed by the government for one-third this amount.

Asks Higher Excise Taxes

Appearing before the Senate committee July 20 and 21, Mr. Morgenthau renewed his recommendation for increased excise taxes but did not mention any levy specifically. On the House side, he had strongly urged an increase in the federal gasoline tax from 1.5c to 3c and in the lube oil tax from 4.5c to 10c per gal. Ways and Means Committee rejected the "gas" tax hike but did increase the lube tax to 6c.

Mr. Morgenthau had also urged that the pipeline transportation tax be increased from 4.5% to 10% but later withdrew this recommendation in view of the critical transportation in oil brought about by sinkings and diversions of tankers.

In his recommendations to the Senate committee, the Treasury head came out strongly against the 5% tax on common and contract carrier transportation of property, contained in the bill as it passed the House. Mr. Morgenthau contended that this was "inflationary." OPA Chief Henderson had also expressed opposition to the transportation tax.

Text of Remarks

Text of Mr. Morgenthau's remarks on depletion, follow:

"Another highly privileged group having large amounts of income exempt from income tax are the owners of oil wells and mines. I refer to those provisions of the law dealing with percentage depletion. Percentage depletion is a serious breach in our system of taxation according to ability to pay.

"I cannot believe that the taxpayers of America would knowingly sanction a provision of the law which allows owners of oil and gas wells to deduct from their income 27½% of their gross receipts from such wells—not for one year, two years, or the period necessary to return investment, but for an unlimited period. For example, a leading oil company owned a number of oil properties which had cost it $3,000,000. At the time the case was examined percentage depletion of $3,600,000 had already been allowed and the properties still had three-fourths of the oil left.

"Certainly we cannot justify this exemption on the ground that encourages exploration and drilling for oil. There is grave doubt that it has a substantial effect on oil discovery. It would have cost the Federal Government about one-third as much to have paid all the cost of every wildcat well that was drilled in 1941 as to have allowed percentage depletion and the associated intangible drilling expenses. The annual cost of these allowances under the proposed rates would be about $200,000,000."

OPC Undecided Yet On OPA's Revision Of Tubular Prices

NPN News Bureau

WASHINGTON — Before OPC comments on OPA's communication on revision of OPA Price Schedule No. 49, with respect to the sale of excess stocks between oil companies and suppliers, OPC district functional production committees are scheduled to make their recommendations, Petroleum Industry War Council has recommended this procedure.

OPA's communication follows:

Price Rules Set Forth

"Notwithstanding the provisions of any other section of this revised Price Schedule No. 49 on shipments of excess stocks of oil country tubular goods and line pipe authorized by OPC to be made by one oil company or pipe line company to another, and in no other instance, such tubular products may be sold by the oil company or pipe line company making the sale at a maximum price not in excess of the mill selling price delivered to its stocks, plus a charge of not more than $2.00 per ton for handling. The maximum price so established may be f.o.b. the place at which such stock is located.

"When it is demonstrated that the services of a recognized tubular goods jobber are necessary to effect the transfer or sale of such material by the jobber purchasing the material and in turn reselling it and assuming a great risk, this office may approve an additional charge by the jobber of not more than $2.00 per net ton above the aggregate maximum price as above established. Request for permission by a jobber to act in such a transaction may be granted by this office provided the request carries the written approval of the OPC."

'Naturals' Output Up

NPN News Bureau

WASHINGTON — The daily average production of natural gasoline and allied products resumed its upward trend during May, according to Bureau of Mines. Total U. S. production and the major individual area increases follow: (Thousands of gal.)

	May 1942	April, 1942	Increase
Total U. S.	282,156	262,794	19,362
East Texas	23,122	16,046	7,076
Inland Louisiana	17,347	14,097	3,250
Texas Gulf	29,142	25,902	3,240

U. S. Crude Stocks Drop; Still Rise in Texas

NPN News Bureau

WASHINGTON — Total U. S. and foreign crude stocks totaled 250,505,000 bbls. on July 18, dropping 806,000 bbls. from the July 11 total of 251,311,000 bbls., Bureau of Mines reports.

Large drops were reported in Oklahoma, off 613,000 bbls., and the Illinois-Indiana area which dropped 567,000 bbls. However, Texas stocks were again rising higher, totaling 100.552,000 bbls., while California also showed an increase, up 217,000 bbls.

August Quotas Hiked by OPC

NPN News Bureau

WASHINGTON — Recommended daily production of petroleum liquids in the U. S. during August has been set at 4,038,500 bbls. by office of Petroleum Co-ordinator, compared to a recommended daily production during July of 3,842,800 bbls.

August was third successive month that higher production rates have been recommended by OPC, which said this was possible due largely to expansion of overland oil transportation facilities from the Gulf Coast.

California's certification for August was higher for the fifth successive month and was attributed by OPC to the necessity for insuring an adequate supply of fuel oil for military and essential industrial needs in the Pacific area.

Illinois, Oklahoma Down

However, Illinois and Oklahoma certifications were lower, due, OPC said, to the continued decline in productive capacity in those states.

Following are the OPC recommended August production rates by districts and states, compared with July:

	August, 1942 Total Petroleum Liquids	July, 1942 Total Petroleum Liquids
District 1		
New York	15,300	15,300
Pennsylvania	52,800	54,100
West Virginia	17,300	17,800
Total	85,400	87,200
District 2		
Illinois	289,300	304,100
Indiana	20,600	22,000
Kansas	281,900	283,200
Kentucky	14,100	14,100
Michigan	66,800	64,800
Nebraska	4,100	4,100
Ohio	10,500	11,300
Oklahoma	415,500	433,000
Total	1,102,800	1,136,600
District 3		
Arkansas	81,600	78,500
Louisiana	332,600	319,600
Mississippi	50,000	49,900
New Mexico	97,200	89,500
Texas	1,396,700	1,214,400
Total	1,958,200	1,751,900
District 4		
Colorado	7,200	7,700
Montana	22,700	23,100
Wyoming	95,000	96,800
Total	124,900	127,600
District 5		
California	767,200	739,500
Other		
Total United States	4,038,500	3,842,800

Heroy Aids Study Of Closer Drilling In Illinois Fields

NPN News Bureau

WASHINGTON — With William B. Heroy, director of OPC's Division of Reserves, aiding in a survey of Illinois oil fields to determine need for liberalizing M-68 exceptions, results are expected to crystalize in a formal M-68 amendment setting the spacing for individual fields in this state.

Petroleum Co-ordinator Ickes is on record (*NPN July 22, p. 30*) stating that this survey probably will show the desirability of liberalizing M-68 exceptions.

Meanwhile, OPC reports that it is giving the same careful study to applications for M-68 exceptions. Upshot of the survey, one source says, probably will be more liberal exceptions, although it was pointed out that OPC has not been stringent to date.

District 2's production committee is reported to be working with OPC's Heroy on this survey.

OPC Appoints Patten To Reserves Unit

NPN News Bureau

WASHINGTON — Office of Petroleum Co-ordinator has named Dr. Frank V. L. Patten, Austin, Tex., as assistant director of its division of reserves. Formerly, he was chief supervisor of Texas Railroad Commission's oil and gas division. William B. Heroy heads OPC's reserves division.

A resident of Texas since 1926, Dr. Patten is, however, a native of Oklahoma. He was graduated from Texas University with a Doctor's degree in philosophy.

Starting with Texas Railroad Commission as a chemical engineer, he was made director of production in 1939 and in 1941 became chief supervisor of entire oil and gas division.

In 1936-37, he was associate professor of natural gas engineering at Texas A. and M. College. He is a members of Tau Beta Pi, Phi Lamda Upsilon and Sigma Xi.

Kansas Allowable Set

Special to NPN

TOPEKA, Kans. — Kansas Corporation Commission has set state's August certified total production of all petroleum liquids at 281,900 bbls. daily. This figure is same as recommended by Office of Petroleum Co-ordinator and 1300 bbls. below July allowable.

WPB Ponders Oil Producer: Who's the 'Stooge'?

NPN News Bureau

WASHINGTON — WPB heard that a Mississippi producer had violated its Conservation Order M-68 and sent a "cease and desist drilling" telegram.

But — WPB apparently named the well in dispute where it seems no violation had occurred. So, the producer refused to shut in.

Meanwhile, WPB scouts are reported to be looking for the "stooge" who gave 'em the wrong steer and/or the well allegedly spudded in inviolation of M-68.

E. O. Thompson Re-Elected To Texas Commission

Special to NPN

AUSTIN — Chairman Ernest O. Thompson was returned to 6 more years as railroad commissioner by a top-heavy vote over two other opponents in Texas primary elections.

For the unexpired term of Jerry Sadler, Pierce Brooks and Beauford Jester will go into the runoff to be held Aug. 22.

Chairman Thompson had 232,541; Lester Boone 105,978; and Baker Saulsbury 32,730.

Mr. Brooks led the field of 10 in the other commissioner race with 192,507. Mr. Jester had 141,065, and James Kilday, Mr. Sadler's choice as a successor, came in third and out of the money with 79,297.

Winner of Brooks-Jester tilt will probably have to go to courts to oust Mr. Sadler, who still says he's a commissioner.

New Committee to Seek Laws On Secondary Recovery

NPN News Bureau

TULSA — An independent committee to originate, sponsor and press legislation which will make practical and legally possible the carrying on of secondary recovery activities is in process of being formed by President Burdette Blue of Kansas - Oklahoma Division, Mid-Continent Oil & Gas Assn. Independent Petroleum Assn. of America, Kansas Independent Oil & Gas Assn., Kansas Stripper Well Assn., Oklahoma Stripper Well Assn. and Oklahoma City Wilcox Pool Engineering Assn. have all received invitations to co-operate with the name representatives on this committee.

Governors Phillips of Oklahoma and Ratner of Kansas also have been invited to name representatives for their respective states. Gov. Ratner has appointed J. A. Robertson, Kansas Corporation Commission chairman; Harold Medill, commission's chief attorney; and Ralph Pryor, State Oil Advisory Committee chairman, as Kansas' representatives. Names of other members of the committee were not available.

Lists Deferments For Oil Industry

NPN News Bureau

WASHINGTON — Men engaged in refining, drilling, rig building and maintenance service operations in production of petroleum and natural gas may be considered for draft deferment, Maj. Gen. Lewis B. Hershey, Selective Service director, said in instructions to local boards.

Oil was included in a list of 34 board occupational activities in which men may be considered for deferment if they meet these tests:

1. An Army, Navy, Maritime Commission or other agency contract is being filled.

2. A government service, directly facilitating war production, is being performed.

3. The business is "performing a service, governmental or private, directly concerned with providing food, clothing, shelter, health, safety or other requisites of the civilian daily life in support of the war effort".

4. Material is being supplied under subcontracts for the above.

5. The business "is producing raw materials, manufacturing materials, supplies or equipment, or performing services necessary for the fulfillment of contracts" included in the above.

Pipelines were listed separately under a transportation classification.

The list of essential occupations included:

"Production of petroleum, natural gas and petroleum and coal products: drilling, rig building, and maintenance service, service operations, and petroleum refining. Includes also production of tar and pitch, coal gas, and coke."

Defer Oil Technicians, P.I.W.C. Recommends

NPN News Bureau

WASHINGTON — Deferment of the petroleum industry's supervisory, technical and scientific employes from the draft "whose continued employment is essential" and establishment of definite deferment standards, has been recommended by Petroleum Industry War Council.

OPC is requested to take this matter up with Selective Service officials on grounds that:

"To deprive the petroleum industry of the services of its supervisors, technicians, engineers, geologists, and those whose special training and skill are highly developed and peculiarly fitted to the industry will interfere with and hinder the efficient operation of the industry in all of its phases, and thereby directly and adversely affect the war effort of this nation."

Lengthy Lone Star Case Ends Out-of-Court

Special to NPN

AUSTIN—The Lone Star Gas rate case, famous Texas lawsuit that spent 9 years in the courts, has expired finally here —out of court.

An agreed judgment was entered, with the company agreeing to cut its gate rate from 40 to 30c in some 275 Texas cities and towns.

The long, drawn-out litigation started in 1933 when the Texas Railroad Commission, after a year's investigation, ordered the company and its subsidiaries to cut its gate rate from 40 to 32c. This order was fought through many courts, including two trips to the U. S. Supreme Court.

In the meantime, however, the Federal Power Commission ordered the gate rate cut to 30c, and the company July 17 agreed to pass on this cut to the ultimate consumer as of May 15, 1942.

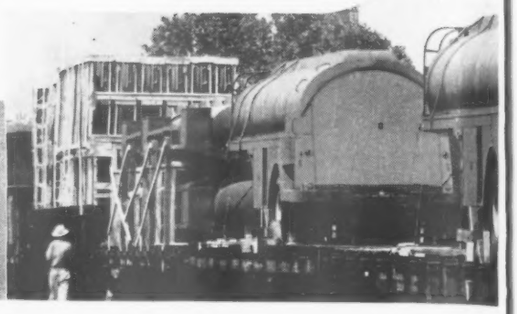
A. P. I. Revises Boiler, Engine Standards

NPN News Bureau

NEW YORK — American Petroleum Institute's standard specifications of internal combustion engines for oil field service and for oil field boilers has geen revised. Also revised is the code of recommended field practice on care and use of oil field boilers. The revisions incorporate changes adopted at the Institute's annual meeting in San Francisco, November, 1941.

Copies of the new edition (A. P. I. Std. 11-C, Fifth Edition A. P. I. Specifications for Internal Combustion Engines for Oil Field Service; A. P. I. Std. 2, Ninth Edition, A. P. I. Specifications for Oil Field Boilers; and A. P. I. Code 2, Second Edition, A. P. I. Code of Recommended Field Practice on Care and Use of Oil Field Burners) may be obtained from the Institute, 50 West 50th St., New York, or the Continental Bldg., Dallas, Tex., for 50c each.

GOING TO WAR



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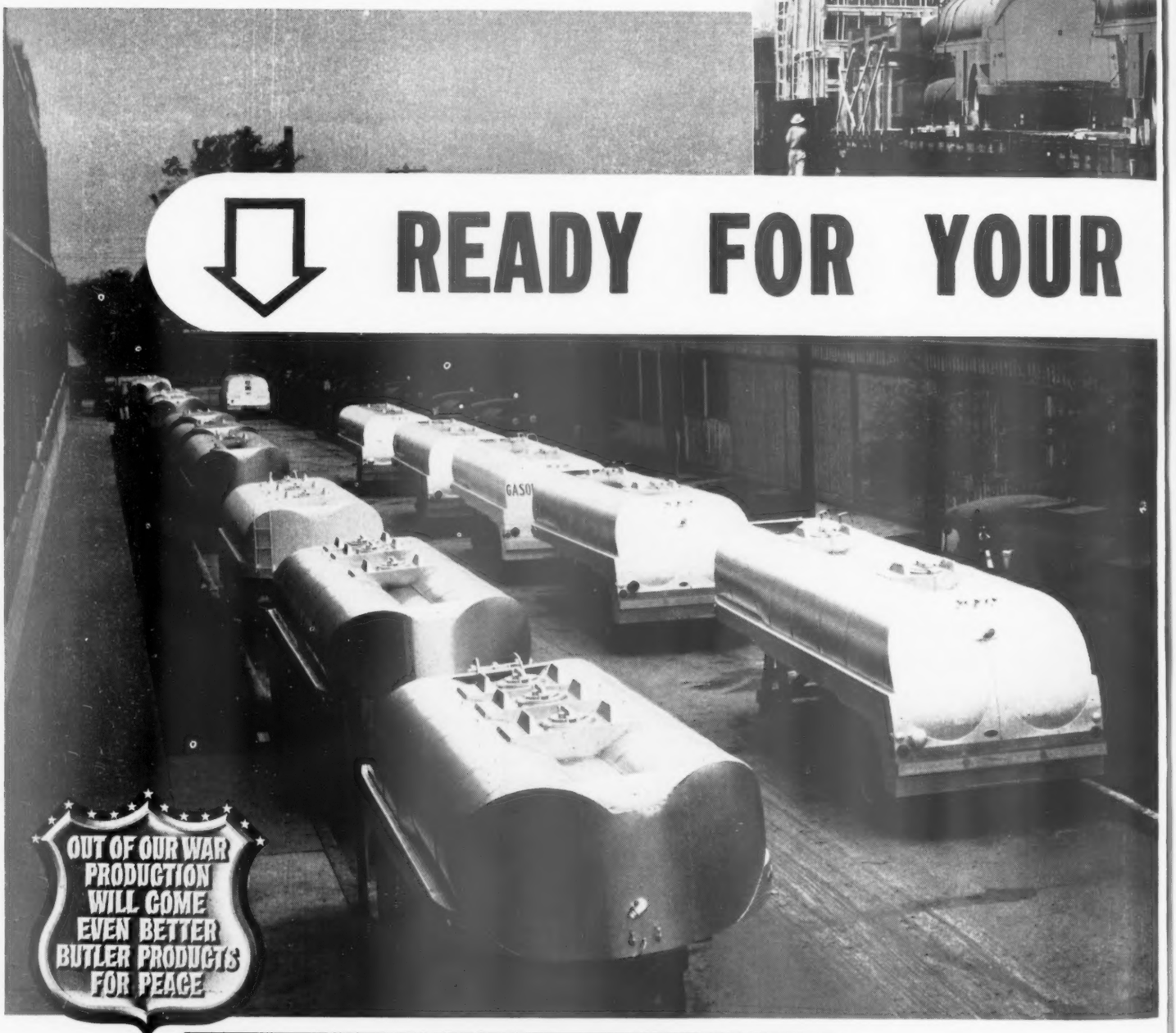
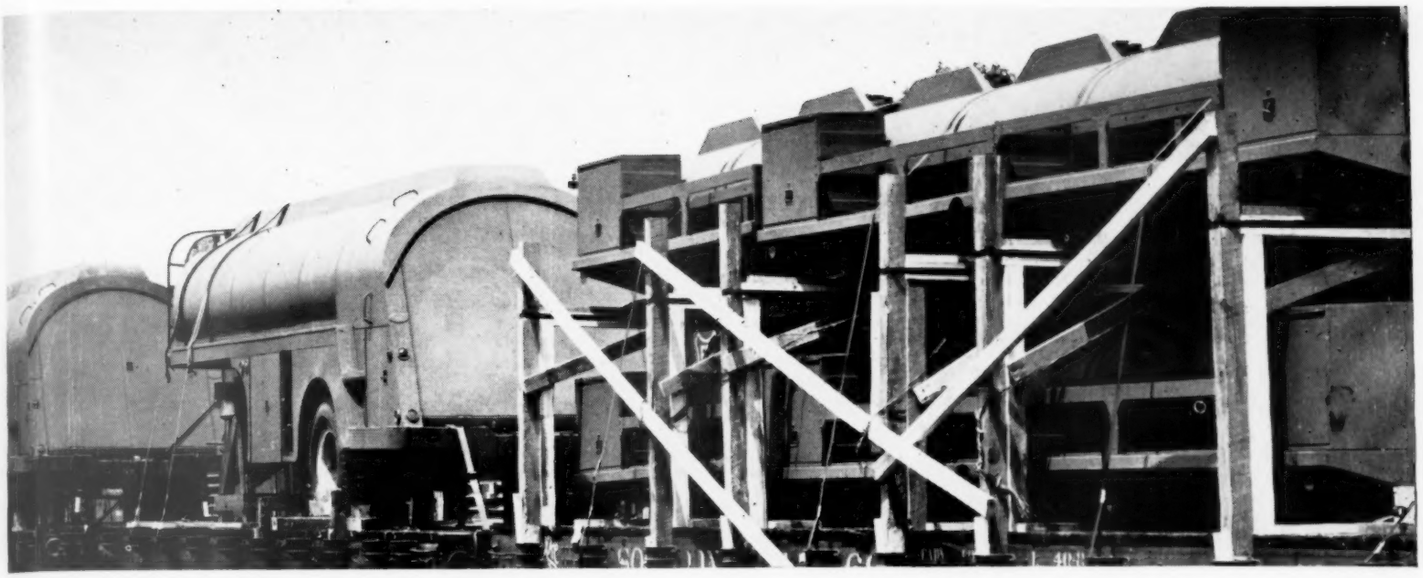


BUTLER TWIN-



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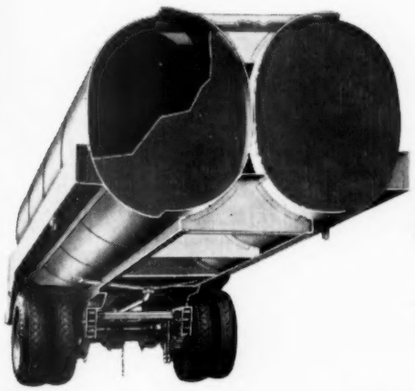
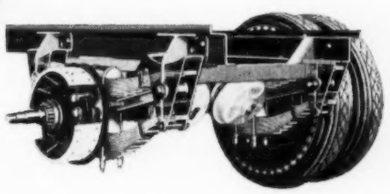
By the trainload Butler Truck Tanks and Butler Twin-Tank Safety Transports are going to war.

Fortunately, Butler Twin-Tank Safety Transports for the trade have also been rolling off the production lines of enlarged Butler factories. A good stock of the three and four thousand gallon sizes await delivery on presentation of your Certificates of Transfer (P. D. 321 Forms). Twin-Tanks with one, two or three compartments can be supplied while this stock lasts. We suggest that you wire or telephone.



Butler Twin-Tank construction gives you the only transport with I-beam integral frame deeper than the tank body and a 20 to 1 factor of safety.

Two-Step Springing gives Butler Twin-Tank Safety Transport a soft, floating ride when traveling empty—frees it of road shocks, lengthens its life.



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TANK *Safety* TRANSPORT

Oil TRANSPORTATION

Oil to be Hauled Eastward In Solid 60-Car Trainloads

NPN News Bureau

WASHINGTON—Arrangements have been completed for movement of crude oil and products in 60-car trainload lots at express speed straight from producing or refining area to central destinations along the Atlantic seaboard.

Plan was worked out among railroads, OPC transportation committees and ODT, and is being put into effect immediately.

This trainload plan will reduce the turnaround of tank cars by 30% and have the effect of adding thousands of cars to eastern service.

By block movement in 60-car lots to ocean terminals along the Atlantic Seaboard, the plan will also restore a large short-haul tonnage to transport trucks.

Trainloads from Mississippi and Louisiana oil fields to New Jersey points should reach New Jersey destinations in 4 days, and New England in 5 days. Trains from Texas and Oklahoma producing and refining areas should cover the distance to New Jersey points in 5 days, and should reach New England destinations in 6 days. Same schedule is to be maintained on return of the empties. A day at each end for loading and unloading is allowed.

Reduced Turn-Arounds

This is expected to reduce the average turn-around to 12 or 13 days. At present, counting in shipments District 2 as well as District 3, the average turn-around is 18 days.

It has been estimated that the equivalent of 3750 tank cars is made available to the East by each day's reduction in turn-around time.

So, a 5 or 6 days' reduction, as contemplated by ODT, would have the effect of adding some 20,000 or more tank cars to eastern service. At present, there are some 62,000 tank cars hauling to the East.

Rails Work Out Plan

To maintain this schedule, the railroads have worked out many time-saving steps, such as:

Joint inspection by the carriers at interchange points where the train is delivered by one railroad to the tracks of another.

Provision for quick repairs when it is necessary to switch out a tank car from the train.

Block movement of empties. Cars will be assembled at various junction points and dispatched in solid trains to a general destination regardless of the routing over which they moved under load.

Moving as a through passenger train (although not at same speed), the oil trains will be handled through terminal areas over the mainline route instead of going through freight yards.

Some Small Lots, Too

While moving cross-country in a 60-car trainload to a point in New Jersey, for example, the train will not necessarily unload all of its cars at that point, according to the ODT announcement.

"There will be smaller blocks of cars—two and the three and four cars each — which will move to various destinations in the New Jersey and New York areas," said ODT. "These cars necessarily will be subject to longer turn-around time than those unloading at the original destination."

From other sources, however, it was learned that the oil companies plan to move the tank cars in large blocks to ocean terminals. So far as possible, then to bulk plants by transport truck as was the case in pre-war days when tankers supplied the East Coast.

Report Movements Daily

A reporting system has been set up by which the railroads will daily advise ODT and the tank car section of the A.A.R. of all oil train movements.

Raymond B. Croll, deputy assistant director of ODT's division of railway transport, at Chicago, has charge of the oil movement from the fields eastward.

A. R. Pelnar, deputy assistant director of railway transport in New York, will supervise the handling of equipment to eastern destinations, and will work with the railroads to expedite the unloading of the tank cars and their return to the fields.

The 60-car trainload plan was worked out by the railroad companies, the Assn. of American Railroads, and transportation committees of OPC, in cooperation with ODT, the announcement said.

* * *

New England Oil Men Hopeful Of New Transportation Plans

Special to NPN

BOSTON — New England oil men are now breathing a little easier over the transportation situation but they won't let their hopes rise until several more hurdles are cleared.

Meanwhile, New Englanders are watchfully awaiting results of the relief measures announced in Washington over the week-end.

These were: Announcements of the 60-car trainload plan and RFC's willingness to remove the "price barrier" to buying oil in the Mid-West and to offset the extra costs of using trucks (as well as tank cars) as substitutes for tanker transportation.

These steps were part of a 4-point program backed by New England oil men, which was publicly urged as long ago as May 26 by J. F. White, Boston, of White Fuel Corp. (*See NPN June 3, p. 23.—Ed.*)

The program has been pressed at Washington with added determination during the past two weeks.

'Pooling' Is Urged

The fourth point in the program—pooling of purchasing and storage of fuel oil—admittedly involves legal obstacles.

But New England oil men recently returned from Washington say that government approval of such pooling might be easier to obtain than some oil company counsel think. Indeed, some of those back from the Capital believe that, if the oil industry itself doesn't take steps in this direction, the government will.

Assembling of tank cars in trainload lots in the southwestern and mid-western refining areas would be greatly simplified, they say, if one purchasing agency were buying for all eastern suppliers. Likewise, if one terminal in an area were to take fuel oil delivery for all suppliers, the tank cars could be returned much faster.

Another point in the New Englander's program is that many more tank care should be assigned to their area *now* while they can take fullest advantage of rail facilities.

Other areas, like the South Atlantic states, can utilize tank cars almost as well in winter months as in the summer and fall. But New England's severe winters lessen the efficiency of tank cars, rail facilities and unloading equipment as well as personnel.

More Tank Cars Needed

To give New England its "fair share" of oil moving into District 1 would require about 20,000 tank cars. However, if this area were given 24,000 tank cars to use now, fewer cars would be needed next winter.

New England oil men are hopeful that the 60-car trainload plan will make enough tank cars available to supply the minimum essential requirements of this area. However, some take the position that if they don't get the cars through this or some other arrangement, ODT Director Eastman should be asked to step in and use his powers to allocate every tank car in the country to specified uses and destinations.

Trucks Figure In Plan

Just where the transport truck enters into the 60-car trainload plan announced July 25 by Mr. Eastman, was not immediately clear from newspaper accounts of the ODT announcement.

However, the New Englanders' program, from the start, has included trucks hauling from central receiving terminals to bulk plants. Otherwise, the advantage of trainload movements beyond the gateways would be lost and several days more would be required to round up the individual cars, as at present.

New England oil truckers are

banking on Mr. Eastman to "count us in."

RFC's indicated willingness to regard transport truck costs as part of the wartime burden imposed by loss of tankers, they feel, removes the last barrier to use of trucks for short hauls at end of the rail movement from the Southeast or the Mid-West.

Up to now, there has been no provision in the East Coast transportation pool's set-up to reimburse shippers for barge or truck movement at end of the long rail haul.

This has meant routing of individual tank car shipments right into bulk plants in most cases. And several days have been added to tank car turn-around in many cases.

Director Eastman, as far back as May 23, stated his belief that the way to solve New England's oil transportation problem was trainload movements to centrally-located terminals, then to fan out from these by truck.

Eastman's Views Stated

Mr. Eastman's views were set forth in his May 23 letter to Sen. Maloney, Conn., as follows:

"Without burdening this letter with too much detail, the situation which we are facing clearly indicates the necessity of getting the greatest possible use of a limited tank car supply.

"This can best be done in the case of oil to New England by train lot movements run solid from point of origin to a single terminal at which the cars can be unloaded and started back empty, also in a solid block, within 24 hours. From this terminal, the oil can be distributed by tank trucks. Several points in New England would, of course, be selected as terminals for such movements.

"Rapidity of turn around in railroad is gained mainly by avoidance of switching and reclassification in railroad yards.

"To accomplish this solid-train-to-one-terminal movement would require, I think the organization of a single receiving agency by the New England oil companies. It was natural in the early stages of the unusual movement that the efforts should have been made by the companies individually and that the carloads of petroleum products should have been billed to a diversity of destinations thus scattering the cars and delaying their return. But the fact that New England's requirements are several hundred carloads per day above the highest level yet reached calls for a kind of planning which will enable the railroads to give the available cars the most rapid turn around that is practical."

Mansfield Bill Signed by FDR

NPN News Bureau

WASHINGTON — The President's signature is now on H.R. 6999, authorizing construction of a cross-Florida barge canal from St. Johns River to Gulf of Mexico, a products pipeline from Port St. Joe and other Gulf points to Jacksonville, and a crude line from Tinsley field, Miss., to either Savannah, Ga., or Charleston, S. C.

Responsibility for constructing the projects and appropriating the $93,000,000 which goes along with the bill rests with the War Department's Chief of Engineers.

Contract to build the 12.75-in. Tinsley to East Coast crude line is expected to be awarded to Trans-American Pipe Line Co., according to TAPCO's President, Aldace Walker.

Tapco will first seek a Presidential proclamation for rights-of-way from Mississippi to the East Coast. Then, the problem of steel allocation will arise. Some sources here say that an OPC pipeline project is held up because of lack of second-hand 12 to 14-in. steel pipe, so presumably Tapco would need practically all new steel.

Tapco expects to get $13,000,000 with which to build this crude line.

The bill signed by the President authorizes one or more pipelines across Florida, plus terminal facilities.

Concerning barge channels, the bill provides for:

A 12-ft. channel, 125 ft. wide, from Apalachee Bay, Fla., to the Mexican border, involving construction of a new segment from Corpus Christi, Tex., to Mexico to be built by Army engineers.

A high-level local barge canal from the St. John River across Florida to the Gulf of Mexico, also to be built by Army engineers.

ODT Order No. 17 Omits Tank Trucks

NPN News Bureau

WASHINGTON—Tank trucks are now exempt from all ODT conservation orders, but may not be for long.

On July 13, ODT scrapped Orders 4 (contract carriers), 5 (private carriers) and that part of No. 6 (local deliveries) which affected contract and private carriers.

In its stead, ODT issued Order No. 17 from which tank trucks were specifically exempt.

The order said "the provisions of this subpart (Subpart K, motor carriers of property) shall not apply to or include any motor truck the primary carrying capacity of which is occupied by a mounted tank or tanks."

ODT called the order "motor carriers of property" to differentiate between it and the common carrier order which recently was revised with the same exclusion of tank trucks.

OPA Common Carrier Ceiling Discussed at Truck Meeting

NPN News Bureau

WASHINTON — Some for-hire oil truckers will be forced out of business if the Office of Price Administration enforces its General Maximum Price Regulation (effective Aug. 1) which sets March 1942 levels as "ceilings" on transportation charges of other than common carriers.

This assertion was made by one oil trucker at a meeting here July 22 of for-hire truckers with OPA's Acting Transportation Director John H. Eisenhardt, Jr. All indications are that OPA's regulations will be enforced, following a month's postponement from July 1—date order was to become effective. Meeting was called by Thomas F. Proctor, general manager of Petroleum Transporters Conference, American Trucking Assn.

Some oil truckers consider themselves common carriers although working on a contract carrier basis, and thus hold that they do not come under OPA's General Maximum Price Regulation, one trucker said.

Another trucker asked if an intrastate contract carrier could circumvent OPA's general maximum price regulation by converting to a common carrier. Mr. Eisenhardt said ICC probably would prevent such a transfer, if the trucker was doing it to get around OPA's General Maximum Price Regulation.

Asked for a definition of a "common carrier", the OPA official said he'd never found such a definition, but suggested that anyone in doubt consult OPA.

If a so-called contract carrier makes his own decision that he is a common carrier (and thus would not be subject to OPA's regulations), but meanwhile presents his case to OPA which might not give him an answer until December or later (perhaps due to lack of OPA personnel to answer his inquiry), is OPA's decision retroactive to Aug. 1 and would such a carrier be granted relief?, a trucker asked.

No relief would be granted, Mr. Eisenhardt replied. However, if it's decided that the trucker acted in good faith, there will be no penalty, he added.

Rates for New Areas

Where truck service was started in areas not provided for prior to April 28 (date OPA General Maximum Price Regulation was issued), new rates, Mr. Eisenhardt explained, might be established as follows:

Either highest offered rate in March; if no offered price, a competitor's price; if no competitor in that area, then prices in a similar area or, if a rate can't be worked out in this manner, then OPA will decide.

Rail Haul to East Drops 39,480 b/d

NPN News Bureau

WASHINGTON — Rail haul of oil to the East slipped back to 749,070 b/d during week ended July 18. A total of 24,971 tank cars were loaded compared with 26,285 during the previous week when shipments soared to 788,550 b/d.

Following is table comparing movements for weeks ended July 18 and July 11:

	Week Ended July 18	Week Ended July 11
Barrels Daily	749,070	788,550
Cars Loaded	24,971	26,285
Loadings by Companies		
Aetna	(none)	2
Allied	26	21
American Bitumuls	72	79
Amsco	181	78
Arkansas Fuel	254	188
Ashland	142	128
Asiatic	7	5
Atlantic Refining	2017	2664
Jas. B. Berry Sons	9	1
Aurora Gasoline Co.	13	(none)
Belcher Co.	59	(none)
Canfield	(none)	1
Chalmette	38	51
Cities Service	1125	1577
Conoco	303	186
Crown	32	11
Daugherty Refinery	(none)	20
Gulf	2113	2106
Hartol	247	152
Old Dutch	3	47
Pan American	1555	1877
Petrol Corp.	218	167
Petroleum Heat & Power	35	31
Pure	359	325
Roosevelt Oil	7	15
Shell	1106	841
Socony-Vacuum	3432	3153
Kentucky Standard	246	202
California Standard	252	(none)
New Jersey Standard	4547	5589
Sohio	81	60
Sun	1809	1615
Talco	61	(none)
Texaco	1611	1850
Tide Water	628	584

YOU'RE *the* MAN *Who's Important NOW!*

NOT THAT YOU, and all transport drivers, haven't always been important in the big job of moving this country's cargoes . . and not that all of the other men in your organization haven't essential war-time work to do, but . . . .

You are actually the key man now in moving the goods that will win the war for us.

On you, very largely, depends how much material will be moved . . how safely and speedily and efficiently it will be moved . . and how long your tires, trucks and Trailers will continue to work. And remember—new tires will become harder and harder to get . . replacement trucks and Trailers almost impossible to get.

So it's your responsibility to keep constantly in mind the things a top-notch Truck-Trailer driver always does . . . .

★ ★ ★

❶ *Check Your Equipment*—

Bulbs, Fuses, Flashlight — are they OK? . . do you have spares? Gas, Oil, Water—full supply? Tires—pressures OK all around on both tractor *and* Trailer? Windshield — is it clean? And how about windows and rear-view mirrors? Emergency Equipment —fire extinguisher, fusees, red flags and fire-pots in working order? Fifth Wheel—properly greased?

❷ *How to Couple*—

Back tractor close to Trailer . . connect brake hoses . . open fifth wheel lock . . apply Trailer brakes (if they are independently operated) . . couple up . . test coupling by trying to pull

FRUEHAUF FRUEHAUF TRAILERS **TRAILERS**

forward with Trailer brakes set or by jerking tractor ahead slightly . . double-check by getting out of cab to see that hook has engaged kingpin . . plug in and check lights . . remove wheel chocks . . crank up Trailer supports . . check brake operation and (if Trailer has air brakes) make sure air brake gauge registers at least 60 lbs. pressure.

❸ *How to Brake—*

With synchronized tractor-and-Trailer brakes, use easy, steady pressure . . don't skid. With independent brakes, apply Trailer brakes first . . smoothly . . then tractor brakes. Down a steep grade, shift to a lower gear and let the engine help you.

❹ *How to Uncouple—*

Apply tractor parking brakes . . then Trailer brakes, if independently operated . . place wheel chocks . . crank down supports . . release fifth wheel lock . . disconnect brake hoses and lights . . pull ahead about 8 inches . . get out and check supports . . pull clear.

❺ *At All Times—*

Apply the driving fundamentals . . the easy, simple rules of safety and control that make up a good job of Truck-Trailer driving. Watch for obstructions . . give hand signals . . make turns carefully, avoid scraping or bumping curbs . . observe traffic lights and signs. And remember the acts of courtesy and helpfulness along the road that have caused the public to know transport drivers as the "Gentlemen of the Highway."

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World's Largest Builders of Truck-Trailers

FRUEHAUF TRAILER CO.

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Sales and Service In Principal Cities

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"ENGINEERED TRANSPORTATION"

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SEE "THE MAN BEHIND THE WHEEL"

"The Man Behind the Wheel", a new sound-slidefilm produced by Fruehauf as an aid to drivers, serves as a complete instruction course for beginners and as a helpful "refresher" for experienced drivers. Besides covering in full detail the various points summarized here, it also tells all about double-clutching, right turns, left turns, backing and other fundamentals.

"The Man Behind the Wheel" was made under the technical direction of Edson Smith, twice national Truck-Trailer driving champion.

As a further aid for beginners, a detailed instruction book is available as a supplement to the picture.

Ask your Fruehauf Branch or write to the factory about a showing of "The Man Behind the Wheel" for the men in your organization.

ENLIST Your Own Trucks, Your Qualified Stations and Your Qualified Dealers In

EVERY manager of oil marketing, whether Independent Jobber or major company manager, wants to enlist every qualified service station, of his company's or his dealers', in the government-promoted U. S. Truck Conservation Corp campaign.

The more *qualified* stations that participate in the campaign the more successful it will be toward achieving the government's war aims of getting the last 100 miles possible out of every truck with the least possible loss of time for repairs and with the least possible use of new parts.

That means the highest degree of inspection and preventive maintenance service.

That means that every man who can participate in this Inspection and Maintenance Service must do so.

That means that every such man must be continually on the alert to get every truck owner and truck driver to use his inspection and maintenance service.

That means the best salesmanship, but above all it means the best of SALES MANAGEMENT on the part of the oil company managers. Service station men and dealers will not apply this necessary truck service to the maximum unless they are coached and closely supervised.

There are several hundred thousand, at least, *qualified* oil industry service stations on whom the constant—yes weekly—Inspection and Maintenance of the country's trucks depend. These are the stations that can apply the lubrication that reduces wear, that can render much of the electrical and tire service to prolong the life of the trucks, that even can render some of the mechanical service. BUT particularly these are the stations that can DISCOVER, by their constant inspection, the moment when a repair job if immediately done will prolong the life of a part and cut down dead truck time.

Not all oil company outlets can qualify for the Service Emblem of the U. S. Truck Conservation Corps, the emblem that says the outlet has signed a pledge to the U. S. and that it is equipped to render the real Inspection, Maintenance and in the case of shops, mechanical service, that is required by the Office of Defense Transportation.

Only those oil outlets that are equipped to give correct lubrication service and intelligent inspection will get the emblem. ODT believes that an oil industry outlet that can render at least half of the services listed for its "1000 Mile Inspection and Servicing"—and preferably 60% to 70%—is qualified to be designated as an Official Station.

ODT does not expect oil industry outlets to equip themselves to render mechanical service. The regular truck dealers who have shops and the qualified truck repair garages will take care of the mechanical work, especially the complicated work. But ODT is depending on the qualified oil industry outlets to see that trucks are kept properly lubricated, that truck electrical, battery and tire equipment is kept in good repair, and ODT also depends on oil industry outlets that contact trucks several times a week and even several times daily to do a good job of selling this campaign to the truck drivers and owners, the while these oil industry outlets also keep a sharp eye out for necessary mechanical repairs that driver and owner may overlook.

The oil industry's qualified outlets, its salesmen and its managers are the first line of this country's fight to get the most out of its trucking equipment.

Director John L. Rogers of the Motor Transport Division of ODT (also a member of the Interstate Commerce Commission), in order to speed up and simplify the distribution of the promotion literature of this truck campaign and also to make sure that only qualified outlets, truck and parts sales agencies and repair garages get the Official Station emblem, is making the distribution through the truck and parts manufacturers and the oil companies rather than direct to the outlets that will post the emblem.

Director Rogers and his assistant Sam Houston, donated by International Harvester to manage the campaign, are asking all national gasoline brand oil companies to take charge of the distribution of the emblems and promotion material through not only their own bulk service stations, but also through their branded jobbers.

Independent refiners are being asked to promote the campaign to their jobbers but any oil company that may be overlooked is asked to write his supplier or write direct to ODT at Washington. However, as the staff at Washington handling this campaign is limited, oil marketers are urged to make use of their supplier's services wherever possible.

To make sure that the interested industries understand the campaign a series of meetings is planned at which a representative of ODT will present the program.

Material is now being sent out. If you have not received yours, get in touch with your supplier at once. If he cannot take care of you then write U. S. Truck Conservation Corps, Office of Defense Transportation, Interstate Commerce Commission Building, Washington, D. C.

To see what of your own service stations and of your dealers can qualify to participate in this campaign, check their services against the list of services printed under the heading of "1000 Mile Inspection" printed in *NPN June* 24, *p.* 30. Then enlist at those stations that qualify at once.

Warren C. Platt
Editor and Publisher

How Britain Saved Trucks Despite Scarcity of Parts

Oil company truck owners in this country can get better service from their trucks by heeding British truck practices in wartime, is the story in a special report for American truck owners written by members of a special committee of the Society of Automotive Engineers.

The Office of Defense Transportation, sponsoring the U. S. Truck Conservation Corps campaign, has an advisory committee of the S.A.E. which is detailing specific ways of maintaining trucks and of patching up worn parts without using replacements. New truck parts may not always be available so ODT is starting now to conserve present parts.

Oil companies, ODT recognizes, have a three-part interest in this truck campaign: one as the supplier of truck maintenance; two, as the educator of truck owners and drivers to the value of the campaign; and three, in applying the campaign to oil company trucks, in the producing field, at the refinery and in the marketing division.

Various reports will be issued by ODT from its advisory committee of the Transportation and Maintenance Section of the S.A.E. Below is a summary of the first report on Britain's 3-year experience with her trucks and buses in this war.

Despite far less ample supplies of spare parts than operators had at their command in this country when the United States entered the war, and despite the fact that many vehicles and stores of spare parts were destroyed in air raids, Britain has kept her highway transport facilities in operation.

The S.A.E. found that, as might be ex-

In U. S. Truck Conservation Corps Campaign

pected, the British have developed many methods for reclaiming and rebuilding available used parts in order to make the most of existing equipment. The salient features of preventive maintenance as used in England follow:

Pistons

Pistons are removed at predetermined periods for inspection. Worn ring grooves are turned out for oversize width piston rings. Worn or broken ring lands including top land in aluminum pistons are welded solid and re-turned. Skirts are expanded by any one of several American processes. Tin plating has been used to prevent seizure of cast iron pistons. Badly worn piston pin holes have been bored out and fitted with phosphor bronze bushings and in some cases, pins have been oversized by chromium plating.

Crankshafts

Both chromium plating and metal spraying have been used. There is one complaint that journals are not reliabe to less than .002 in tolerance which presents difficulties in line boring. This would indicate that British machining is not up to American standards. Some operators use standard undersizes before building up the crankshaft while others keep shaft to standard to eliminate the necessity for several undersize bearings.

Camshafts

One firm reports that it applies stellite to worn cams and then grinds them with a machine of its own design.

Valve, Valve Mechanism

Large valves have been turned down and used to replace those of smaller size. In some cases, valve stems have been brought up to standard size by chromium plating and in others, the valve guides have been filled with bronze welding rod and rebored. Some valves have been refaced with stellite. Similar treatment has been successful on valve tappets. Chromium plating has also been used on tappets. Chromium plating has also been found useful on rocker arm shafts.

Clutches

Clutch faces on the flywheel have been repaired by stellite deposition. There is a record of one operator straightening buckled clutch plates by heating them with a gas ring and subjecting them to pressure between two cast iron plates. Chromium plating has been used successfully on clutch discs. Electric welding has proved successful on toggle levers. Nickel and chromium plating, as well as deposition by electric welding, has been successful on a number of transmission shafts and other parts such as shifter forks.

Differential

Metal spraying has been used to rebuild differential yokes at the surface that holds the differential bearings. This is difficult to machine so that the ring gear remains square with the carrier but it has been done. Some firms have been successful in building these surfaces up with electric welding. Sleeves on the inside of differential cases have been built bored out. Spring pads have been built up by oxy-acetylene welding and then up by electric welding.

Springs

Broken main leaves have been converted into intermediate leaves where brokage has occurred adjacent to the spring eye. Shackle pins have been chrome plated. In addition to building them up to standard size, this has doubled the life of the pins by providing increased resistance to wear and prevention to rusting. Some pins have been machined down and fitted with undersize bushings.

Wheels

Where ball or roller bearings have become loose in front wheel hubs, bronze welding has been used to build up the internal areas so they can be rebored. Some hubs have been chrome or nickel plated.

Front Axle

Chrome plating has been used to build up king pins while one operator has machined his king pins down and fitted undersize bushings. Another grinds king pins down to a standard undersize and then builds them up to regular standard with welding material after subsequent use.

Axle Shafts

Axle shaft splines are built up and filled in with welding. The splines are then milled into the shaft in such a position that the driving face is of parent metal. Splines have also been built up with chromium plating. Keyways have been reclaimed with bronze welding.

Cylinder Heads, Cylinder Blocks

Cylinder heads have been salvaged and leaks stopped by welding, metal spraying and cold welding. Welding and cold welding has also been successful on cylinder blocks. Valve seats have been built up by welding stellite onto the worn valve seat. Both cast iron and aluminum crankcases have been successfully welded. Minor cracking of blocks and heads as a result of leaking head gaskets has been cured with bronze welding.

Dates for 11 Meetings Set by ODT

NPN News Bureau

WASHINGTON—Meetings to sell the U. S. Truck Conservation Corps maintenance plan to the entire oil industry, particularly jobbers, tentatively have been set for 11 cities out of the 14 where they will be held.

First meeting is scheduled for New York in Room 712, Chanin Building, 122 E. 42nd St., on Aug. 4. Another meeting is set for Aug. 7 in Cleveland Hotel ball room, Cleveland, Ohio.

Time and place have not been set for other meetings, but tentative dates are:

Boston, Aug. 5; Chicago, Aug. 10; Minneapolis, Aug. 11; Omaha, Aug. 14; Kansas City, Aug. 17; Tulsa, Aug. 18; Houston, Aug. 20; New Orleans, Aug. 21; and Atlanta, Aug. 24.

Stations Have Decals

Office of Defense Transportation, meanwhile, warned truckers not to send their signed pledges to Washington, because it is by relinquishing the pledges to an official U. S. Truck Conservation Corps station that the decals for truck doors are obtained.

To date, ODT has sent out nearly 3,000,000 copies of the preventive maintenance booklet, including 2,860,000 distributed free and 100,000 sold.

Additional copies of the booklets may be obtained from Superintendent of Documents, Government Printing Office, Washington, at following prices:

1 to 100 .....$ .05 each
100 to 1000 ..... 3.75 per hundred
1000 to 5000 .... 20.00 per thousand
5000 and more.....15.00 per thousand

ODT reported that nearly 1,000,000 decals have been sold.

It's blistering summer here . . . *but* it's bitter winter in the stratosphere

Six miles above the earth giant allied bombers are winging their way through sub-zero weather to bring us Victory. Up there perfectly functioning instruments are *vital* and both gunners and guns must be *"on the alert."* No sluggishness can be tolerated . . . so oils that become thick and gummy at low temperatures would never do.

That's why Bayou State extreme low pour-test oils were chosen to lubricate delicate aircraft instruments and deadly machine guns. Other important war tasks have also been assigned to Bayou State oils. —Yes, Bayou State is busy helping to supply some of the oils necessary to hasten the Victory which we know will ultimately be ours.

In spite of this, we have not forgotten our old and reliable customers and friends. You are grand people. It's tough on you and it's hard on us to have to turn away temporarily from the friends of many years. Due to production for Victory we may not be able to give you all the oil you need, but we shall certainly try. *May we be of service to you?*

OILS FOR VICTORY

BAYOU STATE
OIL CORPORATION
SHREVEPORT, LOUISIANA

PRODUCERS • REFINERS • MARKETERS of PROVEN PETROLEUM PRODUCTS

Girlpower at Work

Has the Venture Been Prudent or Foolhardy?

How are girl station attendants actually panning out? Many marketers, faced with growing labor problems, would like to know the real answer. NPN gives it in this article, based on a consumer survey by a staff of experts.

GIRL service station attendants show more interest and enthusiasm in their work than men. But men have a slight edge on the girls in sales effort.

This is the opinion of an independent organization of survey specialists, following a study of "girlpower" operations in a mid-western city of 300,000.

In this survey, made for a large oil company which has been using girl workers for about 90 days in company-operated stations, 15 shopping stops were made at 14 stations. These stations use both men and women—the women doing the same work as men with the exception of tire and lubrication work.

At each stop, $1 worth of gasoline was purchased. The car used had a windshield wiper blade so damaged that it needed replacement—and the oil in the crankcase was below the three-quarter mark. The survey specialists graded both girl and men attendants on two separate bases and the grades were then averaged.

First, the attendant was graded on appearance, manner and sales effort and was designated "poor", "fair", or "good"—percentage variations are shown in a copy of the scoring sheet below.

Second, the attendant was graded on sales and service procedure at the pumps. The shopper circled the grade he believed the operator deserved and the circled figures were then added to give total mark for that division.

Set up of the scoring sheet is shown on page 32.

In order to make an easy comparison between the girls and the men, 7 shopping reports were made on the girls and 7 on the men. Individual reports on the 14 stations showed the following separate results:

Girls' Grade		Men's Grade
92%		92%
77		92
77		87
72		72
72		59
72		52
69		20
76%	average	68%

The percentage given by the surveying specialists on the girls and men who gave service on the points upon which they were graded follows:

	Girls (Good)	Men (Good)
Promptness	100%	100%
Greeting	72	58
Make bid for business	28	42
Check oil	100	86
Check radiator	100	86
Wipe windshield	100	86
Mention or check tires	..	..
Thank you. Call again	72% fair 28% good	28% fair 28% good

Rated on Appearance

From the appearance angle, the men had it on the girls, as the following summary would indicate:

	Girls	Men
Excellent	43%	...
Good	42%	100%
Fair	...	...
Poor	15	...

The poorer showing made by the girls from the appearance standpoint was due mostly to their failure to follow the company's regulations as to uniform. One of the girls wore pink anklets; another wore open mesh stockings; still another hit on the unique idea of wearing huarachos — low-heeled Mexican slippers. The survey report indicated that this threw the whole appearance of the company's uniform out of balance.

The report indicated that the girls' attitude toward their job and the cus-

A housewife without previous sales experience, Lydia Johnson has stepped into a man's job (over 3 months ago) and her level-headedness and ability to get along with people are reflected in her sales record. She "just asks them". Usually, its something the customer hadn't thought of; usually he buys

These two girls, working at an independent marketer's station in Cleveland, Ohio, make a good team for two-to-a-car servicing

Elsie Lucas (left), former drug clerk, has been on the job 5 months at a super service station. Efficient, she can handle a heavy trade and keep her head and a smile. Like her job? "I do. I like it very much." A former department store salesgirl, Magdalen Gary (center), likes her new job, "wouldn't change it for anything". On the job 3½ months at a super service station, she'd rather wait on men customers. Elsie Lucas performing another function in around-the-car servicing. She feels no job on the pump island is too tough for girls; finds her drug store job tired her out more than working in a station

tomer was better than that of the men, as shown by the following comparison:

	Girls	Men
Very pleasing		
Pleasant	100%	28%
Businesslike		58
Indifferent		14
Displeasing		

Sales Effort

When it comes to selling effort, the men had a slight edge, as the following tabulation shows:

	Girls	Men
Good	28%	28%
Fair		14
None	72	58

Some of the girls made particularly good impressions on the professional shoppers as to their sales effort. Here is a report on one girl:

"This girl, in serving the car and in her sales effort on oil was perfection itself. It is one of the outstanding cases in the state, and for skill in handling a sales situation, just about the best. Her appearance was excellent, her manner was nice and pleasant, but still she was all business and to the point. There was no hesitation in her manner in checking the oil and in her speech in inducing the shopper to put in the first quart of oil and then checking the oil again and asking him to put in another quart."

Some general observations of the shoppers indicated that there are still a number of things to be corrected in the general transition from manpower to girlpower. For instance, there is a general tendency for the girls to quickly dash back into the station office after they have served a customer. This, the shoppers point out, gives an approaching customer the impression that the station is "dead" because no one is immediately seen around the station.

Another point that the shoppers noticed was that in many cases where men and girls are working together, the men are inclined to be too gentlemanly. They insist on doing most of the work themselves.

One example was pointed out: just as the shopper's car was through being serviced, another car drove in and the girl made a break to serve the car, but the two men went quickly and called to her: "We will get it". She let them take that car and went inside the office and sat down with her back toward the pumps. Instances of this kind were observed in a number of stations.

But all of the men operators are not so gallant. In one station, after the girl had finished putting in the gasoline, she started back to the office. But the man called her back to the job and she wiped the right side of the windshield and checked the oil.

The independent shopping agency making the report makes the observation that the kind of work the girls do and how well they do it depends a whole lot upon the men at the station. While the agency was about it, they also made a check of the restrooms, using a system somewhat similar, but not as complete, as NPN's service station inspection forms. The men's rooms averaged 90% and the ladies' 91%, which was practically the same average the stations had early in February before girls were employed.

In discussing the use of girls in service stations with the company officials of the oil company having the survey made, they said they were highly pleased with the results to date. The company operates a training school for girl operators in one of its key stations.

The girls are put through a service station training course very similar to the training program given men operators. At present, they are employing men and girls in a ratio of about 50-50. The age scale runs from 21 to 28, but a few girls as young as 19 and some women as old as 30 have been employed.

The supervisor in charge of one company division was much pleased with the way girls operate at stations. This executive has found that girls around 23 years old make the best operators; the older girls of 29 or 30 are generally "set in their ways" and are harder to train and discipline.

One disadvantage is the limitation on the hours. As the girls can work only 8 hours a day, it is hard to work out satisfactory shifts, he points out.

The company for whom the shopping survey was made has found that the matter of education, provided it is not too limited, has no particular bearing on the efficiency of the girls. Many are college graduates, former school

SCORING SHEET

Description of Operator

	Poor 0-60	Fair 61-80	Good 81-100
Operator's Appearance: Uniform clean; shirt clean; clean shaven; clean hands			
Operator's Manner: Very pleasing; pleasant; businesslike; indifferent; displeasing			
Operator's Sales Effort:			

Sales and Service Procedure at Pumps

	None or Poor	Fair	Good
1. Promptness: Be at car when it stops—or hurry to car	0	15	20
2. Greet Customer: Good morning, afternoon or evening sir. Tip hat to lady.	0	7	10
3. Make Bid for Business: May I fill the tank?	0	11	15
4. Hoods Up:			
Check oil—using paper napkin	0	11	15
Check radiator	0	4	7
5. Courtesy Service:			
Wipe windshield; (wipe blade)	0	7	10
Mention or check tires	0	5	8
6. Come Again Service: Thank you—come again	0	10	15
Total			

teachers, ex-salesgirls and office workers.

Officials of the company in discussing the shopping report say that the comparison gives a wartime picture and that in comparing men and girls, the field for securing girls is almost unlimited, while in the case of men, many are employed that in ordinary times could not meet the qualifications.

It is also pointed out that the men generally think they can get a job elsewhere, perhaps paying more money, while in the case of girls they make comparatively high wages compared with ordinary work, and they are anxious to make good.

Practically all the major companies in Cleveland are either using girls or are getting started on a girl-training program. Standard Oil Co. (Ohio) has had a complete training program in force for about 60 days and is using girls in many Sohio stations. The Sun Oil Co. is using girls in 5 of their company-operated stations in Cleveland. But these are only two of several major and independent companies making use of girlpower. Company-operated tire stores and many independent stations are using girls. No manager could be found who was not pleased with the results.

In Cleveland, at least, public reaction is past the stage where uniformed girl station attendants attract any particular attention. Johnny Q. Motorist, if he thinks about it at all, simply takes it as another phase of the war—and not a bad phase at that.

What will happen after the war with the girl station attendants is a question unanswered. But as one oil company executive aptly puts it:

"Station men leaving for temporary defense jobs thinking they can get a station job any time when they come back may find that the company prefers Gertrude or Maggie to an operator who left when he was so badly needed."

Lydia Redwanz, a former farm girl, has been busy on the pump island at a super service station for 3 months. Strangers usually offer to help her; regular customers don't. Sturdy from outdoors environment, she doesn't tire easily; keeps her humor and friendliness—both sales assets

Birtank Pressure Roofs

BIRTANKS—for Gasoline or Oil Storage

REALIZING the great saving to be effected by the storage of volatile oil products under pressure, the Standard Oil Company of Kentucky has used tanks designed for this purpose exclusively at eight of their terminals on the great Plantation Pipe Line system, one of which is shown above.

These tanks range in capacity from 10,000 barrels to 35,000 barrels. The Terminal handles kerosene, tractor fuel, burner oil and three grades of gasoline. While the tanks are of conventional appearance, they are unique in that THEY ARE DESIGNED TO OPERATE AT 1 LB. PRESSURE. Tremendous savings in evaporation losses are thereby realized, when compared with other forms of construction, which of necessity operate at lower pressures.

The Birtank pressure tank is the answer to your evaporation loss problems. For further information on this special form of construction, consult the Birmingham Tank Company, Birmingham, Alabama.

BIRMINGHAM TANK COMPANY

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Fabricators and Erectors of Tanks and General Plate Work—Structural Steel—Shipbuilding

Public Transit Business Up 26.28%, But Private Car Carries Burden

NPN News Bureau

NEW YORK — Even before gasoline rationing and the "pick-up-the-rubber" drive, American tire-savers had started relying on street cars and buses to the extent that 32 representative cities showed an average increase of 26.28% in public transit line fares for the first six months of this year over the first half of 1941, according to a survey made public here today by the B. F. Goodrich Co.

The survey, measuring the effect of the gasoline shortage and rubber conservation measures upon the nation's urban transit habits, showed that there had been an average increase of 28.51% in fares paid on trolley and bus lines in 18 cities of 100,000 population or more, and of 23.41% in 14 cities of less than 100,000 population. It also summarized data on official and unofficial steps taken by many communities to help in rubber and gasoline conservation.

In announcing the findings of the survey John L. Collyer, president of Goodrich, strongly emphasized that while the swing to public conveyances was "a healthy sign of people's eagerness to co-operate", mere continued extension of this trend could not be the answer to the problem of maintaining necessary transportation throughout the nation.

Private automobiles must be kept rolling—through "stretching the miles in the tires now in service," Mr. Collyer emphasized—because the total seating capacity of all the nation's 57,000 common-carrier buses, its 40,000 railroad coaches, and its 41,000 surface, rapid transit and electric suburban cars is only 7,000,000.

Must Keep Cars Running

He compared that total with the 29,000,000 private passenger automobiles to show how overwhelming the burden on common carriers would be if "even an important fraction of those 29,000,000 cars should go completely out of service for the duration."

This indicates, he said, why the answer to the coming crisis in personal transportation must be found in the active and earnest co-operation of every citizen in "making every mile serve the best purpose" and in getting the utmost service out of present tires; and in much greater use of the "swap ride" formula. Mr. Collyer called attention to the fact that the Local Transport division of the ODT has prepared a pamphlet describing in detail how to set up wartime transit programs and has distributed them to interested persons and groups throughout the country.

The greatest increase in use of public transit facilities was reported in Corpus Christi, Tex., where passenger fares paid were up 57%. Smallest gain reported, Mr. Collyer said, was in New York City, a mere 4%, but he explained that this was due to the metropolitan area's inherent dependence upon public transit. The 4%, however, did serve to bring down the over-all average somewhat.

How Cities Tackled Problem

Examples of how communities in all sections of the country have tackled the problem are given in the survey:

In San Francisco, under the guidance of an "administrator of local transportation", studies are being made on needs in interurban transportation, local mass transportation, private and commercial automobiles and business and industrial groups. Plans are being formed for future needs in each division.

A plan to adjust working hours of Detroit employes is the co-operative work of the Detroit Street Railway, the Traffic Engineering Bureau and the Office of Defense Transportation co-ordinator there. Buses are being removed as rapidly as possible from those Detroit streets equipped with rails. Buses are making fewer stops, and traffic signals are being timed to give preferred passage to mass transportation vehicles rather than to private automobiles.

Tulsa's Chamber of Commerce, Mr. Collyer said, has arranged for group meetings "to acquaint citizens with orders issued by the Office of Defense Transportation restricting the operation of motor trucks."

A "committee on staggering of working hours" in Wilmington, Del., is studying the "rider habits" of all employes in the city, it was stated. After circularization of a questionnaire, recommendations will be made by a committee.

The Washington, D. C., board of commissioners has sent out cards urging motorists to share cars to relieve capital congestion, and in Vicksburg, Miss., the city bus company is preparing to establish additional lines backed by a pledge from citizens to "make the most complete use possible of these facilities."

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REEVES ARMY TWILL SCORES A HIT!
Customers impressed by neat, trim work uniforms mean steady customers. And for steady wear, Reeves Army Twill is your best choice for quality and economy. This fabric passes U.S. Govt. tests for strength, endurance and colorfastness. For fabric vitality it's a leader! Specify it on your next order for work uniforms.
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See your nearest dealer for uniforms, sport and work clothes made from these famous fabrics, or write for leaflet to:
OVER 60se million yards of Reeves Army Twill sold to the U.S. Army
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NEW YORK CITY

Air Raid Precautions Adopted By Tide Water's Office

Special to NPN

SAN FRANCISCO — Tide Water Associated Oil Co.'s adoption of a program for safeguarding personnel and property of its general offices in the event of an air raid has been announced by C. R. Brown, assistant to the president.

The building has been surveyed and certain floors established as air raid shelters, partition glass on these floors being removed and replaced with shatterproof wire screen plastic compound. Plate glass transoms have been replaced with plyboard.

TRADEMARKS

The following are trademark applications pertinent to our field pending in the United States Patent Office which have been passed for publication and are in line for early registration unless opposition is filed promptly. For further information address National Trade-Mark Company, Munsey Building, Washington, D. C., trademark specialists.

ARMADA, Ser. No. 452,182, Robert Bales, Jr., Morristown, Tenn. Filed April 7, 1942. For gasoline. Published: July 14, 1942.

Rectangular design lined for red and green, Ser. No. 452,755, The Singer Manufacturing Co., Elizabeth, N. J. Filed May 2, 1942. For lubricating oils. Published: July 14, 1942.

STRATOGAS, Ser. No. 442,882, Sun Oil Co., Philadelphia, Pa. Filed April 23, 1941. For gasoline. Published: July 14, 1942.

WAKE UP and picture of rooster crowing, Ser. No. 446,456, J. A. Hogshire & Son, Inc., Indianapolis, Ind. Filed Aug. 22, 1942. For petroleum products—namely, gasoline and lubricating oils and greases. Published: July 14, 1942.

ROYCO, Ser. No. 450,602, Royal Engineering Co., East Hanover, New Jersey. Filed Jan. 30, 1942. For lubricating oils and greases. Published: July 14, 1942.

AUTOLIFE, Ser. No. 451,375, Autolene Lubricants Co., Denver, Colo. Filed March 4, 1942. For lubricating oils and greases. Published: July 14, 1942.

NATIONAL EN-AR-CO TUNE, Ser. No. 448,871, The National Refining Co., Cleveland, Ohio. Filed Nov. 24, 1941. For flushing and lubricating oil. Published: June 30, 1942.

PHILGUN, Ser. No. 452,313, Phillips Petroleum Co., Bartlesville, Okla. Filed April 13, 1942. For lubricants. Published: June 30, 1942.

PHILSTIK, Ser. No. 452,314, Phillips Petroleum Co., Bartlesville, Okla. Filed: April 13, 1942. For lubricants.

PHILTRAK, Ser. No. 452,315, Phillips Petroleum Co., Bartlesville, Okla. Filed: April 13, 1942. For lubricants. Published: June 30, 1942.

PHILUBE, Ser. No. 452,316, Phillips Petroleum Co., Bartlesville, Okla. Filed April 13, 1942. For lubricants. Published: June 30, 1942.

CHEVRON and representation of a chevron, Ser. 452,875, Standard Oil Co. of Calif., San Francisco, Calif. Mineral oils for parasiticidal sprays and medicinal use. Published July 21, 1942.

AMIDEX, Ser. 452,465, Binney & Smith Co., New York, N. Y. For plasticizer with activating properties for use in mfg. of rubber and rubber-like compounds. Published July 21, 1942.

PHILCUP, Ser. 452,312, Phillips Petroleum Co., Bartlesville, Okla. Lubricants. Published July 21, 1942.

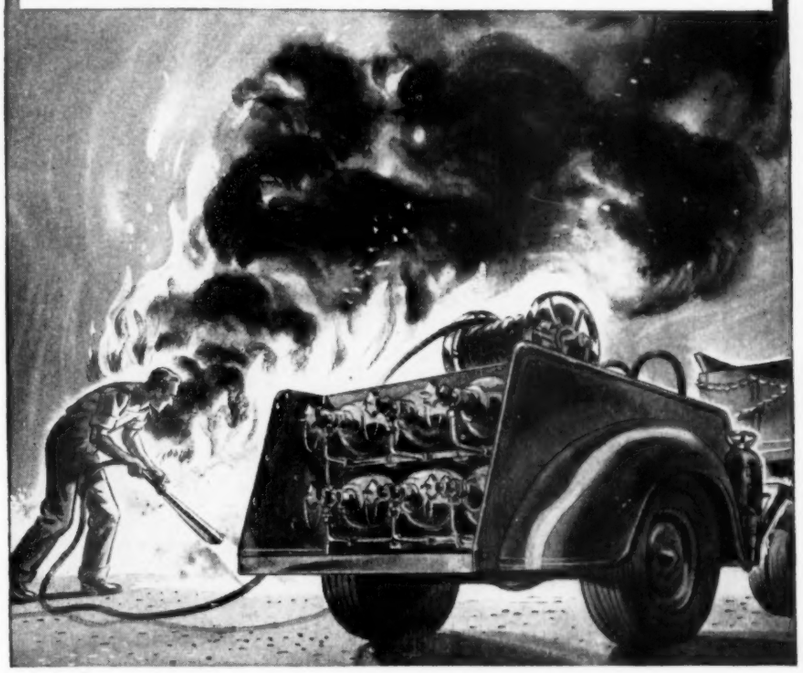
Jersey Standard Refineries Win Minute Man Flags

NPN News Bureau

NEW YORK — Treasury certificates and minute man flags were awarded July 1 to Bayway Refinery, Bayonne Refinery and Eagle division of Standard Oil Co. of N. J. for high percentage of employee participation in purchasing bonds through payroll deductions. Bayonne and Eagle has 100% and Bayway 99% of their active employees subscribing.

Presentation of the flags and certificates was made at the three ceremonies by W. H. Hassinger, deputy state administrator of the war savings staff in New Jersey. G. H. Mettam, New Jersey works manager and film star Lili Damita also spoke at each rally.

FIRE AND HOW TO FIGHT IT!



JOHNNY-ON-THE-SPOT FIRE FIGHTER

FOR PROTECTION OF YOUR PROPERTIES

HAS your plant a fire brigade of its own, with centrally located equipment available for quick action? Looking for a fire fighter that slaps oil fires down in a hurry?

If the answer's *yes*, we'll paint your company's name on a new Kidde Trailer Unit. This one carries 300 lbs. of carbon dioxide with hose reel, special nozzle for heavy-volume discharge. Has two 15-lb. Kidde portables and two pure-water extinguishers to complete the armament against smaller blazes.

When fire breaks out, you just couple this Kidde Trailer onto a fast truck and high-tail to the trouble spot. Then open the Kidde cylinder valves, turn the nozzle release, and hit the blaze with a blast of carbon dioxide snow-and-gas. You can release the cylinders singly, or all at once.

Want to know more about Kidde Trailer Units . . . sizes, weights, prices? Write us for full information.

WHAT ABOUT WATCHMEN?

Watchmen must be courageous, fit, and have no physical disability.

Two of America's most spectacular fires last year were caused by careless watchmen who muffed their jobs. Who stands guard in your plant? Is he alert, strong, responsible? If he's infirm, aged, or irresponsible, find him another job. Hire a good man in his place. Watchmen are vitally important!

FOR SMALL-AREA FIRES

Small in size, strong in its fire-killing wallop is the Kidde four-pounder. It is designed to extinguish those tricky small-area blazes in chemicals and flammable liquids which must be snuffed out fast.

Trigger-control features the Kidde. Aim at the blaze, pull the trigger . . . and socko! A blast of carbon dioxide snow-and-gas smothers the fire *quick!*

Kidde SNUFFS OUT FIRE

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Walter Kidde & Company Incorporated

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For economical distribution in small quantities

The wholesale grocer buys in carloads or trainloads and makes his profit on case sales.

If you now sell only or chiefly in large quantities, a similar "package" operation may be worth considering. You don't need storage or re-shipping facilities. The five strategically located General American Terminals meet every requirement, *without investment on your part.*

There's a real economy in assembling your bulk liquids in a General American Terminal for re-distribution in smaller quantities. Write or phone for proof!

KEEP 'EM ROLLING!

Freight cars—particularly tank cars—are vital to Victory. They must be loaded, unloaded, kept moving with all possible speed. Delays may cost lives!

ONLY GENERAL AMERICAN GIVES ALL THESE ADVANTAGES:

1. *RELIABLE CUSTODIANSHIP.* Our warehouse receipts are highest type of collateral everywhere.
2. *MODERN PROTECTION.* Latest safety appliances; lowest insurance rates; minimum evaporation losses.
3. *INDEPENDENT OWNERSHIP.* Strictest privacy. We do not buy, sell or refine any oils.
4. *NO WHARFAGE.* There is no wharfage charge at our own private dock.
5. *SPEED WITH SAFETY.* Day and night crews complete facilities, eliminate all shipping delays.
6. *LARGE TANK CAR FLEET.* Now working night and day, delivering essentials of war.
7. *NO CONTAMINATION.* Separate pumps, lines, storage zones for dissimilar commodities.

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CARTERET, NEW JERSEY (Port of New York)
CORPUS CHRISTI, TEXAS GALENA PARK, TEXAS (Port of Houston)

A DIVISION OF GENERAL AMERICAN TRANSPORTATION CORP.

COMING MEETINGS

SEPTEMBER

Oil Trades Assn. of New York, Sports Day, Pelham Country Club, Pelham Manor, N. Y., Tues., Sept. 8.

National Assn. of Assessing Officers, 9th Annual Conference, Cosmopolitan Hotel, Denver, Colo., Wed.-Sat., Sept. 9-12.

National Petroleum Assn., Annual Meeting Hotel Traymore, Atlantic City, N. J., Wed.-Fri., Sept. 16-18.

American Gas Assn., San Francisco, Calif., Mon.-Wed., Sept. 28-30.

New England Tax Conference, Hotel Biltmore, Providence, R. I., Wed.-Thurs., Sept. 30-Oct. 1.

OCTOBER

American Institute of Mining & Metallurgical Engineers, Regional Meeting, St. Louis, Mo., Fri., Oct. 2.

31st National Safety Congress and Exposition, Stevens Hotel, Chicago, Ill., Mon.-Fri., Oct. 5-9.

29th National Foreign Trade Convention, Hotel Statler, Boston, Mass., Wed.-Fri., Oct. 7-9.

Texas Mid-Continent Oil & Gas Assn., 23rd Annual Meeting, Dallas, Tex., Thurs.-Sat., Oct. 8-10.

American Society of Mechanical Engineers, Fall Meeting, Rochester, N. Y., Mon.-Wed., Oct. 12-14.

American Institute of Mining & Metallurgical Engineers, Petroleum Division, Los Angeles, Calif., Mon.-Sat., Oct. 12-17.

Indiana Independent Petroleum Assn., Hotel Severin, Indianapolis, Ind., Wed.-Thurs., Oct. 14-15.

National Stripper Well Assn., Annual Meeting, Wichita, Kans., Mon., Oct. 19.

National Tax Conference, Netherlands Plaza Hotel, Cincinnati, Ohio, Mon.-Thurs., Oct. 19-22.

Ohio Petroleum Marketers Assn., Annual Convention and Marketing Exposition, Hotel Deshler-Wallick, Columbus, Ohio, Wed.-Thurs., Oct. 20-21.

Independent Petroleum Assn. of America, 13th Annual Meeting, Lassen Hotel, Wichita, Kans., Mon.-Wed., Oct. 19-21.

Society of Automotive Engineers, Midwest Fuels & Lubricants Regional Meeting, Tulsa, Okla., Thurs.-Fri., Oct. 22-23.

National Lubricating Grease Institute, 10th Annual Meeting, New Orleans, La., Sun.-Thurs., Oct. 25-29.

Oil Trades Assn. of New York, Annual Banquet, Waldorf-Astoria Hotel, New York, N. Y., Tues., Oct. 27.

American Institute of Mining & Metallurgical Engineers, Petroleum Division, Austin, Tex., Thurs.-Sat., Oct. 29-31.

NOVEMBER

American Assn. of Petroleum Geologists, Los Angeles, Calif., Thurs.-Fri., Nov. 5-6.

California Natural Gasoline Assn., Los Angeles, Calif., Fri., Nov. 6.

American Petroleum Institute, 23rd Annual Meeting, Palmer House, Chicago, Ill., Mon.-Fri., Nov. 9-13.

American Institute of Chemical Engineers, 35th Annual Meeting, Netherland Plaza, Cincinnati, O., Mon.-Wed., Nov. 16-18.

American Chemical Society, National Chemical Exposition and National Industrial Chemical Conference, Sherman Hotel, Chicago, Ill., Tues.-Sun., Nov. 24-29.

American Society of Mechanical Engineers, Annual Meeting, New York, N. Y., Mon.-Fri., Nov. 30-Dec. 4.

15th National Exposition of Power and Mechanical Engineering, Central Palace, N. Y., Mon.-Sat., Nov. 30-Dec. 5.

FEBRUARY, 1943

American Institute of Mining & Metallurgical Engineers, Annual Meeting, New York, N. Y., Mon.-Thurs., Feb. 15-18.

Iowa Independent Oil Jobbers' Assn., Hotel Fort Des Moines, Des Moines, Ia., Wed.-Fri., Feb. 24-26.

APRIL

American Petroleum Institute, Division of Production, Eastern District, Wm. Penn Hotel, Pittsburgh, Pa., April 8-9.

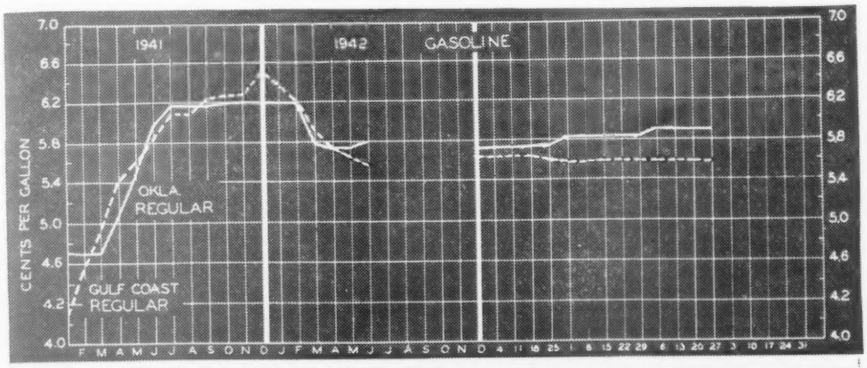
MAY

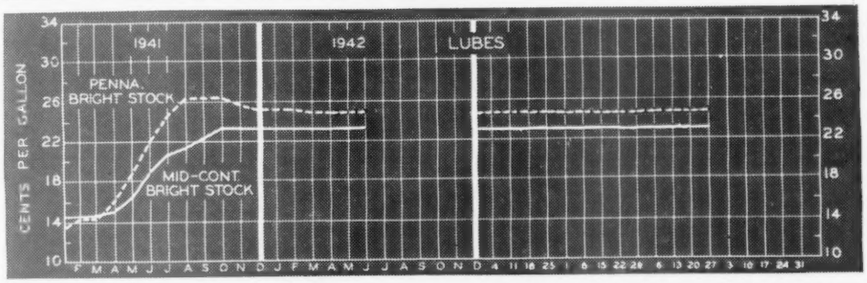
Petroleum Industry Electrical Assn., Houston, Tex., Wed.-Thurs., May 5-6.

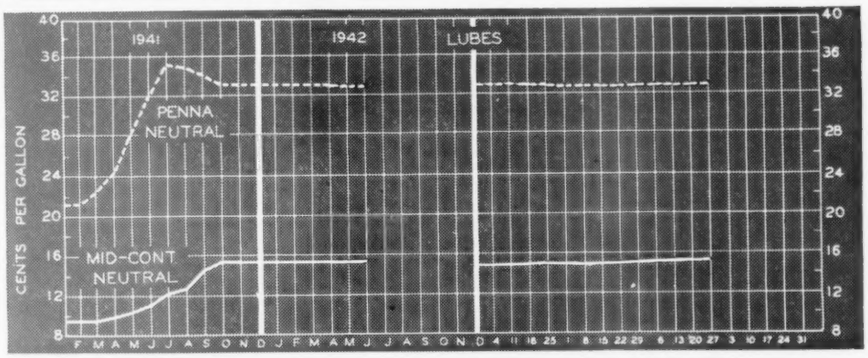
STATISTICS

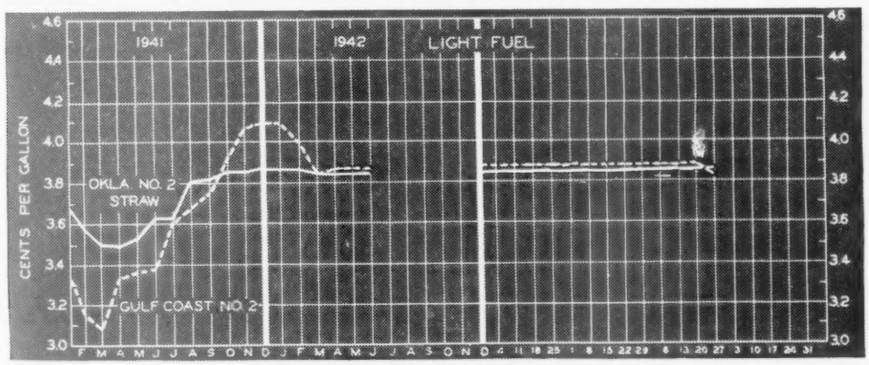
Refinery Prices

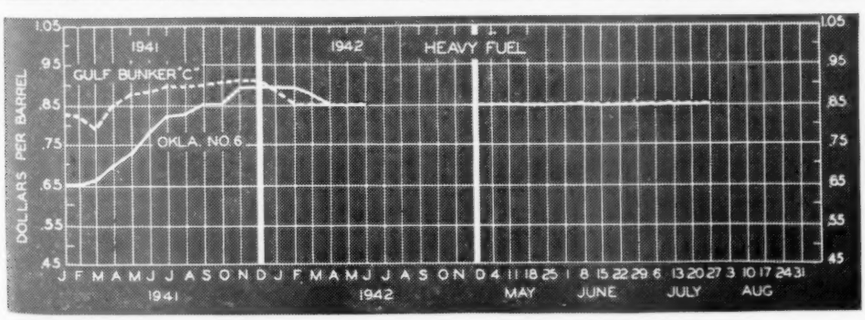
Monthly prices in graphs are averages of daily high and low prices shown in Platt's Oilgram Weekly prices are averages of high and low prices shown in Monday Oilgram, and in NPN










1941
1942
HEAVY FUEL
DOLLARS PER BARREL
GULF BUNKER "C"
OKLA. NO. 6
J F M A M J J A S O N D J F M A M J J A S O N D 4 11 18 25 1 8 15 22 29 6 13 20 27 3 10 17 24 31
1941
1942
MAY
JUNE
JULY
AUG

Pennsylvania Crude Runs

(Compiled by National Petroleum Assn. from reports of all companies which refined Pennsylvania crude. Figures in barrels.)

Week Ended	Daily Average	Week Ended	Daily Average
Jan. 3	72,172	Apr. 18	82,067
Jan. 10	77,676	Apr. 25	79,353
Jan. 17	81,658	May 2	80,399
Jan. 24	84,089	May 9	80,761
Jan. 31	82,603	May 16	86,551
Feb. 7	74,927	May 23	85,563
Feb. 14	77,436	May 30	80,046
Feb. 21	82,682	June 6	83,996
Feb. 28	84,173	June 13	83,808
Mar. 7	80,131	June 20	83,648
Mar. 14	76,862	June 27	80,837
Mar. 21	79,510	July 4	77,973
Mar. 28	84,185	July 11	83,919
Apr. 4	78,175	July 18	84,892
Apr. 11	82,557	1941 Low	61,384
		1941 High	84,326

Production of Natural Gasoline & Allied Products

(Bureau of Mines figures in thousands of barrels)

	May 1942*	Apr. 1942*	May 1941**
Appalachian	232	254	164
Ill., Mich., Ky.	331	333	126
Oklahoma	870	825	747
Kansas	143	143	130
Texas	3,022	2,722	2,342
Louisiana	555	460	222
Arkansas	85	79	71
Rocky Mountain	240	237	208
California	1,240	1,204	1,171
Total U. S.	6,718	6,257	5,181
Daily Average	217	209	167

**Includes recycle condensate.

*Includes recycle condensate and liquefied petroleum gas.

Pennsylvania Lubricating Oils

(Compiled by National Petroleum Assn. from reports of all companies which refine Pennsylvania grade crude oil. Figures in barrels.)

	Production June, 1942	Inventory June 30, 1942	Inventory May 31, 1942	Inventory June 30, 1941
1. Raw Long Residuum	79,036	67,018	60,379	48,327
2. 600 Steam Refined Stock	296,546	289,795	282,806	248,990
3. Other Steam Refined Stock	56,916	92,627	93,817	109,309
4. Finished Dewaxed Long Residuum	45,116	61,788	57,031	33,355
5. Bright Stock	192,114	269,245	252,654	280,019
6. Viscous Neutral	87,267	125,525	90,472	52,735
7. Viscous Neutral	95,695	142,696	115,303	85,961

Item 1 includes all raw long residuum below, and not salable as, 600 fire.

Item 2 includes all steam refined stock commonly sold or used as 600 and as raw material for bright stock.

Item 3 includes all material not reported in items 1 & 2.

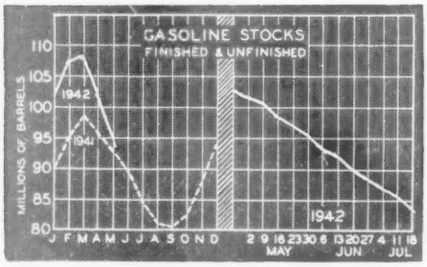
Item 5 does not include any material reported in item 4.

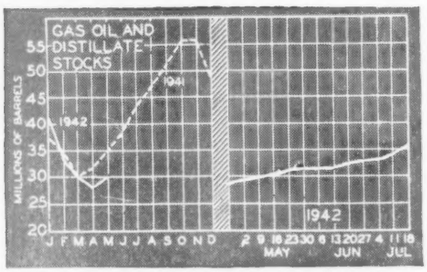
Item 6 includes viscous neutral below 180 vis. but not below 142 vis. at 100.

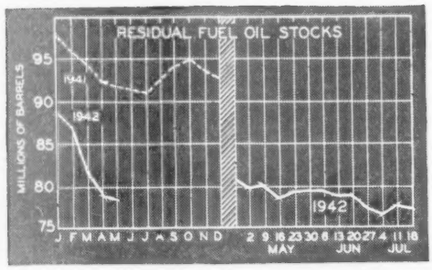
Item 7 includes viscous neutral 180 vis. at 100 and above.

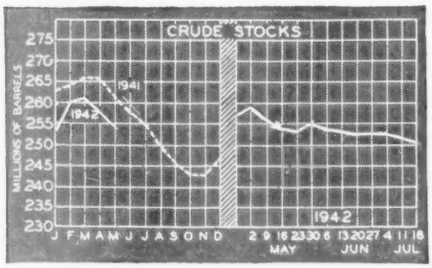
STATISTICS

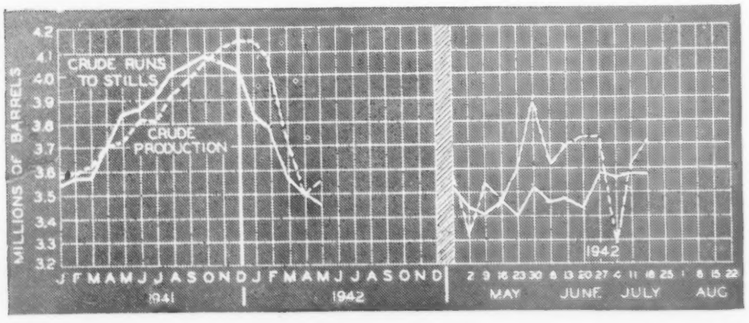
Monthly figures are actual as reported by Bureau of Mines. Weekly figures are as estimated by American Petroleum Institute on Bureau of Mines basis, except crude stocks which are as reported by Bureau of Mines.











Refinery Operations

(American Petroleum Institute figures in thousands of barrels of 42 gallons each. Figures include reported totals plus an estimate of unreported amounts and are therefore on a Bureau of Mines basis.)

Districts	Daily Potential Refining Capacity Week Ended July 18	Daily Potential Refining Capacity Week Ended July 11	Per Cent of Refining Capacity Reporting Week Ended July 18	Per Cent of Refining Capacity Reporting Week Ended July 11	Daily Average Crude Runs to Stills Week Ended July 18	Daily Average Crude Runs to Stills Week Ended July 11	Per Cent of Reporting Capacity Operated Week Ended July 18	Per Cent of Reporting Capacity Operated Week Ended July 11
Combined‡	2,383	2,383	89.7	89.7	1,612	1,563	67.6	65.6
Appalachian	174	174	84.5	84.5	166	160	95.4	92.0
Ind., Ill., Ky.	784	784	84.9	84.9	734	762	93.6	97.2
Okla., Kans., Mo.	418	418	81.1	81.1	377	385	90.2	92.1
Rocky Mt.	138	138	50.7	50.7	95	100	68.8	72.5
California	787	787	90.9	90.9	598	612	76.0	77.8
TOTAL U. S.—B. of M. Basis	4,684	4,684	86.9	86.9	3,582	3,582	76.5	76.5
U. S.—B. of M. Basis July 19, 1941					3,819			

Districts	Gasoline Production at Refineries inc. Natural Blended Week Ended July 18	Gasoline Production at Refineries inc. Natural Blended Week Ended July 11	Stocks of Finished and Unfinished Gasoline Week Ended July 18	Stocks of Finished and Unfinished Gasoline Week Ended July 11	Total Stocks Gas Oil & Distillates Week Ended July 18	Total Stocks Gas Oil & Distillates Week Ended July 11	Total Stocks Residual Fuel Oil Week Ended July 18	Total Stocks Residual Fuel Oil Week Ended July 11
Combined‡	5,037	4,579	39,818	40,642	16,643	16,052	16,944	17,073
Appalachian	461	449	2,825	2,741	564	567	556	528
Ind., Ill., Ky.	2,432	2,519	15,682	16,131	4,336	4,041	3,495	3,447
Okla., Kans., Mo.	1,267	1,253	7,556	7,645	1,459	1,375	1,474	1,470
Rocky Mt.	298	303	2,254	2,307	379	365	565	555
California	1,468	1,572	15,934	16,192	11,795	12,018	54,196	54,818
Total U. S.—B. of M. Basis	10,963	10,675	84,069*	85,658**	35,176	34,418	77,230	77,891
U. S.—B. of M. Basis July 19, 1941	12,570		86,291		40,724		91,059	

*Finished 76,434,000 bbls.; unfinished 7,635,000 bbls. **Finished 78,037,000 bbls.; unfinished 7,621,000 bbls.
‡Includes East Coast, Inland Texas, Texas Gulf, Louisiana Gulf, and North Louisiana-Arkansas Districts.

Crude Oil Stocks

(Bureau of Mines figures in thousands of barrels)

Grade or Origin	July 11	July 18	Change
Pennsylvania Grade	3,375	3,325	— 50
Other Appalachian	1,285	1,375	+ 90
Lima-Michigan	1,790	1,815	+ 25
Illinois-Indiana	13,434	12,867	—567
Arkansas	2,845	2,791	— 54
Kansas	7,954	7,976	+ 22
Louisiana:	13,623	13,701	+ 78
Northern	4,790	4,980	+190
Gulf Coast	8,833	8,721	—112
Mississippi	1,963	1,906	— 57
New Mexico	6,454	6,463	+ 9
Oklahoma	46,664	46,051	—613
Texas:	100,435	100,552	+117
East Texas	26,716	26,876	+160
West Texas	23,951	23,818	—133
Gulf Texas	26,493	26,592	+ 99
Other Texas	23,275	23,266	— 9
Rocky Mountain	15,594	15,598	+ 4
California	35,471	35,688	+217
Foreign	424	397	— 27
Total U. S. refinable	251,311	250,505	—806
Heavy in California	10,835	11,148	+313

N.P.N. Gasoline Index

	Dealer T.W. Cents Per Gallon	Tank Car Cents Per Gallon
July 27	11.42	7.10
Month ago	11.30	7.09
Year ago	10.01	6.70

Dealer index is an average of "undivided" dealer prices, ex-tax, in 50 cities.

Tank car index is a weighted average of following wholesale markets for regular-grade gasoline, FOB refineries or terminals: Okla., Mid-Western, W. Penna., Calif., N. Y. Harbor, Philadelphia, Jacksonville, Boston and Gulf Coast.

Oil Burner Statistics

(Compiled by Bureau of Census. Figures include burners consuming Commercial Standard No. 1 fuel oil or heavier.)

	May 1942	April 1942	May 1941	May 1940
New orders, less cancellations	10,680	10,883	36,194	18,154
Unfilled orders, end of month	17,843	16,334	22,612	4,700
Shipments	9,171	11,600	28,848	17,829
Stocks, end of month	39,277	34,509*	25,682	19,239

	5 months total (January—May) 1942	1941	1940
New orders, less cancellations	72,087	116,690	71,273
Shipments	72,338	102,121	69,478

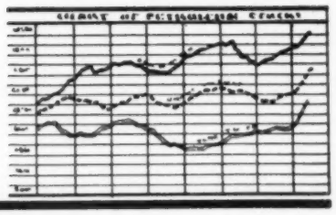
*Revised.

Crude Oil Production

(American Petroleum Institute figures)

	WEEK ENDED July 18 Barrels (Daily Average)	WEEK ENDED July 11 Barrels (Daily Average)
Oklahoma	374,650	372,000
Kansas	286,050	271,150
Nebraska	3,450	3,600
Texas	1,232,250	1,203,950
Louisiana	317,500	315,300
Arkansas	72,250	70,950
Mississippi	81,700	83,850
Illinois	278,850	283,950
Indiana	19,150	19,000
Eastern (Ill. & Ind. excluded)	98,650	95,500
Michigan	61,800	67,900
Wyoming	91,950	91,900
Montana	21,750	21,400
Colorado	7,150	6,400
New Mexico	65,150	65,150
California	701,100	685,400
Total U. S.	3,713,400	3,657,400

Oil MARKETS



Pennsylvania

NEW YORK, July 25.—Shipments of kerosine, fuel oils and gasoline continued heavy from Western Penna. refineries the past week under constant demand for light products. Refiners generally were shipping material as fast as they made it and left with "not a bit of inventory."

Two refiners in lower field who had lowered quotations for kerosine to 6.125c for 45 and 46 w.w. and 6.25c for 47 w.w. when transportation pool surcharges were in prospect said they now were quoting 6.25c and 6.375c, respectively, without surcharges. Quotation ranges for all products were unchanged.

Neutral oils remained "quite easy" in relation to their previous scarcity but not weak. Bright and cylinder stocks were closely held as ever.

Atlantic Coast

NEW YORK, July 25.—Demand for all products continued steady at points along the Eastern seaboard in week ended July 25, with suppliers generally without much in the way of inventories and for the most part unable to keep up with unseasonable demand for kerosine and fuel oils. Jobber efforts to store light oils in their own and consumers' tanks against next season's needs, lack of tank cars to move material and constant industrial requirements for heavy fuels for immediate consumption are seen as contributing factors creating tightness of all products. Suppliers' quotations were unchanged at all points.

California

LOS ANGELES, July 25.—Steady prices continued on petroleum products here again this week OPA price ceiling levels prevailed on most products.

A firm trend was shown in gasoline. Bottom price on Ethyl was 7c, while 6c and 5c were the respective prices of regular and third grade gasoline.

Mid-Continent

TULSA, July 25.—Heavy demand for most refined products, evidenced by inter-refinery as well as jobber inquiries from Mid-West and East Coast, continued without appreciable change the past week, according to Mid-Continent refiners. Stocks of gasoline, light and heavy fuels, generally were low and closely held; many refiners were shipping daily production. Sales for most part limited to regular customers.

Sales prices for Grade 26-70 natural gasoline were 0.25c and 0.125c higher than last reported FOB Breckenridge and FOB Group 3, respectively. Total of 27 cars sold at 2.375c, FOB Breckenridge, and 33 cars at 2.75c, FOB Group 3.

Two Oklahoma refiners advanced refined gasoline quotations; one, all grades 0.125c; the other, 72-74 oct. 0.125c. New quotations for most part fell within existing ranges. Prices for North Texas 72-74 and 63-66 oct. were up 0.5c and 0.075c on lows, respectively, when one refiner advanced his quotations 0.1-0.2c for all grades except Ethyl. Refiners' quotations ranged 5.75-6c for 72-74 and 5.375-5.4c for 63-66.

Mid-Western

CHICAGO, July 25.—Mid-western refiners and tank car marketers reported continued scarcity of material and tank cars. For those who had transportation and could get material, shipments of most products, especially gasoline and light fuels, were heavy. General group of refiners, however, found market "exceedingly tight."

Tank car marketers reported open spot sale of 7 cars of Ethyl, 1 car at 6.5c and 6 cars at 6.375c; 33 cars of "regular," 18 cars at 5.625c, 13 cars at 5.5c, and 2 cars at 5.375c; and 2 cars of 63-66 oct. at 4.75c, FOB Group 3. Refiners' Group 3 quotations ranged 6.75c to 7c for 78 oct., 5.75c to 6c for 72-74 oct., and 5.375c to 5.625c for 63-66 oct. Marketers quotations for the 3 products ranged 6.25c to 6.5c, 5.375c to 5.75c and 4.75c to 5.25c, respectively.

Gulf

NEW YORK, July 25.—Market for refined products at the Gulf continued quiet the past week, with transportation still the "bottleneck" preventing sales. "Tank car inquiries for everything—in seller's cars" reported in the market but turned down by refiners who lack the cars.

"Material is here if you can get boats in," said one refiner, referring to condition of the cargo market. Cargo quotations continued unchanged. "Market seems firm at established prices," one refiner remarked.

Index of Governmental Orders Concerning Petroleum Prices

Orders, "requests", "ceilings", and other statements issued by governmental agencies concerning prices of petroleum and products, prices for which are published in this market section of NATIONAL PETROLEUM NEWS, have been published as follows:

	NATIONAL PETROLEUM NEWS	PLATT'S OILGRAM	Platt's OIL-Law-GRAM
Nov. 21, '41—Maximum prices for paraffin wax	Nov. 26, pg. 5	Nov. 21, pg. 1	Pg. 66
Jan. 17, '42—OPA letter restating contents of letters of Nov. 7, 10 and 28, '41;	Jan. 21, pg. 7	Jan. 19, pg. 1	Pg. 135
Jan. 28, '42—Amendment No. 1 to paraffin wax price schedule	Feb. 11, pg. 20	Jan. 29, pg. 1	Pg. 153
Feb. 2, '42—OPA Price Schedule No. 88	Feb. 11, pg. 17	Feb. 4, pg. 1	Pg. 159
Feb. 5, '42—Amendment No. 1 to OPA Price Schedule No. 88	Feb. 11, pg. 18	Feb. 9, pg. 1	Pg. 167
Feb. 7, '42—Amendment No. 2 to OPA Price Schedule No. 88	Feb. 11, pg. 18	Feb. 9, pg. 1	Pg. 167
Amendment No. 1 to Revised Price Schedule No. 88 (Combined form of Schedule 88 and its 4 previously issued amendments)	Mar. 11, pg. 15	Mar. 7, pg. 1	Pg. 205
Mar. 25, '42—Maximum prices for Penna. grade crude	Apr. 1, pg. 19	Mar. 25, pg. 1	Pg. 237
Mar. 26, '42—Maximum s.s. prices for regular-grade gasoline in East Coast & Pacific Northwest	Apr. 1, pg. 11	Mar. 25, pg. 4	Pg. 243
Mar. 26, '42—Approval of 0.5c advance in gasoline, Atlantic Coast states	Apr. 1, pg. 10	Mar. 25, pg. 4	Pg. 241
Mar. 26, '42—Approval of 0.4c advance in kerosine and light fuels, Atlantic Coast states	Apr. 1, pg. 10	Mar. 25, pg. 4	Pg. 241
Mar. 26, '42—Maximum prices for Bunker "C" & No. 6 fuel, East & Gulf Coasts	Apr. 1, pg. 11	Mar. 25, pg. 4	Pg. 242
Apr. 4, '42—Minimum 3c margin for operators in Curtailment Area	Apr. 8, pg. 3	Apr. 7, pg. 2	Pg. 271
Apr. 4, '42—Prices for crude from wells opened since Oct. 1, 1941	Apr. 8, pg. 5	Apr. 6, pg. 1	Pg. 273
Apr. 18, '42—Price advance for Ritchie, La. crude	Apr. 22, pg. 10	Apr. 20, pg. 2	Pg. 309
Apr. 27, '42 — Tank wagon prices: Arkansas, Montana, New Mexico, Oklahoma, Wyoming	May 13, pg. 7	Apr. 29, pg. 1	Pg. 353
Apr. 28, '42—East Coast advance effective Apr. 30	Apr. 29, pg. 3	Apr. 29, pg. 1	Pg. 355
Apr. 28, '42—Maximum service station prices	May 6, pg. 12	Apr. 29, pg.	Pg. 358
May 12, '42—Maximum prices Pacific Coast area	May 20, pg. 7	May 14, pg. 2	Pg. 402
May 26, '42—Discounts frozen at Oct. 1-15, '41 levels	June 3, pg. 9	May 27, pg. 1	Pg. 439
June 27, '42—East Coast advance effective June 29	July 1, pg. 3	June 27, pg. 1	Pg. 534

REFINERY and SEABOARD PRICES

In bulk lots by Motor Transport, Tank Car, Barge or Tanker as shown

NOTE—Parenthetical figures after prices indicate number of companies quoting when less than three companies are quoting.

HOW PRICES ARE REPORTED—

Refinery and Seaboard prices in National Petroleum News are gathered by PLATT'S OILGRAM and are published in the Monday issue of the OILGRAM.

PLATT'S OILGRAM is a reporting service issued in three identical editions daily from News Bureaus at New York, Cleveland, and Tulsa, Okla. PLATT'S OILGRAM gathers and publishes what its publisher and representatives believe to be accurate news of sales, prices and current happenings affecting the oil industry and that will be of interest to its subscribers. As this information is usually private, OILGRAM reports it according to what it is able to obtain from sources deemed reliable.

All information is supplied without guarantee as to its completeness, accuracy, time of transmission or promptness of delivery.

The subscriber receives this information for his private use and not for resale or further distribution.

Publisher reserves the right to change the extent, nature and form of showing this information at any time.

Prices shown in the tables are quotations (meaning sellers' general offers or posted prices), or actual sales prices, reported to OILGRAM by refiners for "open spot" transactions, except as otherwise specified.

Prices arrived at by discounts off a specified price or "market date of shipment," prices named in contracts or prices arrived at in accordance with any arrangement made prior to date of sale, are not for "open spot" transactions and therefore are not considered in making the price tables. Prices made to brokers and prices in "Inter-refinery" transactions are also not considered except as may be noted.

All prices are for "immediate" shipment except in Gulf Coast bulk transactions where shipment is generally to be made in ninety days. Prices are FOB refineries, pipelines, or tanker terminals in districts designated.

Prices shown are for quantities in bulk such as tank car lots, motor transport lots or barge lots; and in cents per gallon; heavy fuel oils are in dollars per barrel of 42 U.S. gallons; wax and petrolatums are in cents per pound. Prices applying to barges or cargoes only are so designated.

Prices do not include taxes or inspection fees. Prices are published at the close of the business day.

Mid-Western prices in the tables were gathered from refiners with offices located in Chicago and the surrounding territory. While the prices are quoted on a Group 3 (Oklahoma) freight basis, this is in accordance with the custom of the oil industry which uses Group 3 as a price basis for the ease of comparing prices even when the material originates in another refining district. Other refinery prices are given by and for the particular refining district where the material is made and from which it is shipped.

When prices obtained by OILGRAM do not conform to these conditions the exception and the new conditions are noted in the news lead or in conjunction with the price table by footnote or otherwise, for the particular refinery or sales district involved.

Crude oil and products covered by OILGRAM'S news and price service, except where noted, have been represented to the publisher as fully up to the customary trade specifications indicated and according to the generally accepted methods of test; and all crude oil and all products thereof as having been lawfully produced and transported.

Any apparent error should be reported to the nearest OILGRAM or National Petroleum News office at once as no correction will be made after the second issue of the OILGRAM or National Petroleum News following its publication.

NOTICE—Owing to great demand, refiners generally limit quotations to regular customers and refuse bids, though higher, from others. Refiners' prices and sales shown; bids reported in market leads.

Summary of Daily Gasoline Prices (July 21 to July 27)

	Monday July 27	Friday July 24	Thursday July 23	Wednesday July 22	Tuesday July 21
U. S. Motor, (ASTM octane)					
78 octane Ethyl:					
Oklahoma	6.625– 6.75	6.625– 6.75	6.625– 6.75	6.625– 6.75	6.625– 6.75
Mid-Western (Group 3 basis)	6.75 – 7	6.75 – 7	6.75 – 7	6.75 – 7	6.75 – 7
N. Tex. (For shpt. to Tex. & N. M. dest'ns.)	6.6 – 6.875	6.6 – 6.875	6.6 – 6.875	6.6 – 6.875	6.6 – 6.875
W. Tex. (For shpt. to Tex. & N. M. dest'ns.)	6.875 (2)	6.875 (2)	6.875 (2)	6.875 (2)	6.875 (2)
72-74 octane:					
Oklahoma	5.75 – 6	5.75 – 6	5.75 – 6	5.75 – 6	5.75 – 6
Mid-Western (Group 3 basis)	5.75 – 6	5.75 – 6	5.75 – 6	5.75 – 6	5.75 – 6
N. Tex. (For shpt. to Tex. & N. M. dest'ns.)	5.75 – 6	5.75 – 6	5.7 – 6	5.7 – 6	5.7 – 6
W. Tex. (For shpt. to Tex. & N. M. dest'ns.)	5.875	5.875	5.875	5.875	5.875
63-66 octane:					
Oklahoma	5.375– 5.625	5.375– 5.625	5.375– 5.625	5.375– 5.625	5.375– 5.625
Mid-Western (Group 3 basis)	5.375– 5.625	5.375– 5.625	5.375– 5.625	5.375– 5.625	5.375– 5.625
N. Tex. (For shpt. to Tex. & N. M. dest'ns.)	5.375– 5.4	5.375– 5.4	5.3 – 5.375	5.3 – 5.375	5.3 – 5.375
W. Tex. (For shpt. to Tex. & N. M. dest'ns.)	5.625 (1)	5.625 (1)	5.625 (1)	5.625 (1)	5.625 (1)
60 octane & below:					
Oklahoma	5 – 5.25	5 – 5.25	5 – 5.25	5 – 5.25	5 – 5.25
Mid-Western (Group 3 basis)	5 – 5.25	5 – 5.25	5 – 5.25	5 – 5.25	5 – 5.25
N. Tex. (For shpt. to Tex. & N. M. dest'ns.)	4.75 – 5.125	4.75 – 5.125	4.75 – 5.125	4.75 – 5.125	4.75 – 5.125
W. Tex. (For shpt. to Tex. & N. M. dest'ns.)	5.125	5.125	5.125	5.125	5.125
Motor Gasoline, 72-74 octane (ASTM)					
New York harbor	11.7 –12.7	11.7 –12.7	11.7 –12.7	11.7 –12.7	11.7 –12.7
New York harbor, barges	11.6 –11.7	11.6 –11.7	11.6 –11.7	11.6 –11.7	11.6 –11.7
Philadelphia district	11.7 – 12.2	11.7 –12.2	11.7 –12.2	11.7 –12.2	11.7 –12.2
Baltimore district	11.45	11.45	11.45	11.45	11.45
Motor Gasoline:					
Western Penna. Bradford-Warren:					
"Q" Gasoline, Min. 70 Oct. (ASTM)	7.5–7.75 (2)	7.5–7.75 (2)	7.5 –7.75 (2)	7.5 7.75 (2)	7.5–7.75 (2)
Western Penna. Other Districts:					
"Q" Gasoline, Min. 70 Oct. (ASTM)	7.25 – 7.3	7.25 – 7.3	7.25 – 7.3	7.25 – 7.3	7.25 – 7.3

REFINERY PRICES

Gasoline—U. S. Motor (ASTM) except where otherwise specified

Prices in Effect	July 27	July 20
OKLAHOMA		
78 oct. Ethyl	6.625– 6.75	6.625– 6.75
72-74 oct.	5.75 – 6	5.75 – 6
63-66 oct.	5.375– 5.625	5.375– 5.625
60 oct. & below	5 – 5.25	5 – 5.25
60-62 400 e.p.	5.125 (1)	5 (1)
MID-WESTERN (Group 3 basis)		
78 oct. Ethyl	6.75 – 7	6.75 – 7
72-74 oct.	5.75 – 6	5.75 – 6
63-66 oct.	5.375– 5.625	5.375– 5.625
60 oct. & below	5 – 5.25	5 – 5.25
N. TEX. (For shpt. to Tex. & N. M. dest'ns.)		
78 oct. Ethyl	6.6 – 6.875	6.6 – 6.875
72-74 oct.	5.75 – 6	5.7 – 6
63-66 oct.	5.375– 5.4	5.3 – 5.375
60 oct. & below	4.75 – 5.125	4.75 – 5.125
60-62, 400 e.p.	5.25 (1)	5.25 (1)
W. TEX. (For shpt. to Tex. & N. M. dest'ns.)		
78 oct. Ethyl	6.875 (2)	6.875 (2)
72-74 oct.	5.875	5.875
63-66 oct.	5.625 (1)	5.625 (1)
60 oct. & below	5.125	5.125
CENT. W. TEX. (Prices to truck transports)		
80 oct. & above	7 (2)	7 (2)
72-74 oct.	5.875 (2)	5.875 (2)
67-69 oct.	5.375 (1)	5.375 (1)
62 oct. & below	5.125 (2)	5.125 (2)
AMARILLO, TEX. (For shpt. to W. Okla. & Tex. differential teritory.)		
60 oct. & below	No Price	No Price
60-62, 400 e.p.	No Price	No Price
KANSAS (For Kansas destinations only)		
78 oct. Ethyl	7.25 (1)	7.125 (1)
72-74 oct.	6 –6.2 (2)	5.875–6.2 (2)
63-66 oct.	5.625–5.8 (2)	5.5 –5.8 (2)
60 oct. & below	5.25 –5.4 (2)	5.125–5.4 (2)

Prices in Effect	July 27	July 20
ARK. (For shipment to Ark. & La.)		
72-74 oct., leaded	6.125 (1)	6.125 (1)
70-72 oct. "	5.75 (1)	5.75 (1)
62 oct. "	5.375 (1)	5.375 (1)
60 oct. & below, unleaded	5.25 (1)	5.25 (1)
WESTERN PENNA. (Motor gasoline)		
Bradford-Warren:		
"Q" Gasoline, Min. 70 Oct. (ASTM)	7.5–7.75 (2)	7.5–7.75 (2)
Other districts:		
"Q" Gasoline Min. 70 Oct. (ASTM)	7.25 – 7.3	7.25 – 7.3
CENTRAL MICHIGAN (FOB Central Mich. refinery group basis for shpt. within Mich.; shpts. may originate at plants outside Central group.)		
U.S. Motor: (Oct. ASTM):		
72-74 oct.	8 – 8.5	8 – 8.5
67-69 oct.	7.5 – 8 (2)	7.5 – 8 (2)
Str. run gasoline, excluding Detroit shpt.	5 – 6	5 – 6
OHIO (S. O. Ohio quotations for statewide delivery and subject to exceptions for local price disturbances)		
72-74 oct.	8.375	8.375
CALIFORNIA U.S. Motor:		
78 oct. & above (Ethyl)	7 – 8.75	7 – 8.75
70-75 oct. (regular)	6 – 7.75	6 – 7.75
65 oct. & below (3rd grade)	5 – 6.75	5 – 6.75

Kerosine, & Gas Fuel Oils

Prices in Effect	July 27	July 20
OKLAHOMA		
41-43 grav. w.w.	4.375– 4.5	4.375– 4.5
42-44 grav. w.w.	4.5 – 4.625	4.5 – 4.625
Range Oil	4 – 4.375	4 – 4.375
No. 1 P.W.	3.875– 4.25	3.875– 4.25
No. 1 straw	3.875– 4 (1)	3.875– 4 (1)
No. 2 straw	3.6 – 4.125	3.6 – 4.125
No. 3 fuel	3.5 (2)	3.5 (2)
U. G. I. Gas Oil	3.625–3.75 (1)	3.625–3.75 (1)
No. 6 fuel	$0.80-$0.90 (2)	$0.80-$0.90 (2)
14-16 fuel	$0.95 (1)	$0.95 (1)
MID-WESTERN (Group 3 basis)		
41-43 grav. w.w.	4.375– 4.625	4.375– 4.625
42-44 grav. w.w.	4.5 (2)	4.5 (2)
Range Oil	4 – 4.1	4 – 4.1
No. 1 p.w.	3.875– 4.125	3.875– 4.125
No. 2 straw	3.6 – 3.625	3.6 – 3.625
No. 3	3.5	3.5
No. 5	$0.85 (1)	$0.85 (1)
No. 6	$0.80-$0.85 (2)	$0.80-$0.85 (2)
N. TEX. (For shpt. to Tex. & N. M. dest'ns.)		
41-43 grav. w.w.	4.125– 4.75	4.125– 4.75
No. 1 P.W.	4.1 –4.2 (2)	4.1 –4.2 (2)
AMARILLO, TEX. (For shpt. to W. Okla. & Tex. differential territory.)		
41-43 grav. w.w.	No Price	No Price
No. 1 straw	4.3 (1)	4.3 (1)
KANSAS (For Kansas destinations only)		
41-43 grav. w.w.	No Price	No Price
42-44 gravity w.w.	4.8 –4.875 (2)	4.8 –4.875 (2)
No. 1 p.w.	4.25–4.3 (2)	4.25–4.3 (2)
No. 6 fuel	$0.90 (1)	$0.90 (1)

REFINERY PRICES (Continued)

(NOTE—Parenthetical figures after prices indicate number of companies quoting when less than three companies are quoting.)

NOTICE—Owing to great demand, refiners generally limit quotations to regular customers and refuse bids, though higher, from others. Refiners' prices and sales shown; bids reported in market leads.

Kerosine, Gas & Fuel Oil

(Continued)

Prices In Effect	July 27	July 20
ARK. (For shipment to Ark. and La.)		
41-43 grav. w.w.	4.625 (1)	4.625 (1)
No. 1	4 (1)	4 (1)
No. 2	3.5 (1)	3.5 (1)
No. 3 fuel	3.5 (1)	3.5 (1)
Tractor fuel, for shpt. to Ark. points only.	5 (1)	5 (1)
WESTERN PENNA.		
Bradford-Warren:		
45 grav. w.w.	6.25 – 8.65	6.25 – 8.65
46 grav. w.w.	....	....
No. 1 fuel	6.25 – 8.65	6.25 – 8.65
No. 2 "	6.25 – 8.725	6.25 – 8.725
No. 3 "	6.25 – 8.85(2)	6.25–8.85 (2)
36-40 gravity	6.25	6.25
Other districts:		
45 grav. w.w.	6.125– 8.525	6.125– 8.525
46 grav. w.w.	6.135– 6.25	6.125– 6.25
47 grav. w.w.	6.25 – 6.375	6.25 – 6.375
No. 1 fuel	5.875	5.875
No. 2 "	5.875– 8.045	5.875– 8.045
No. 3 "	5.875– 8.045	5.875– 8.045
36-40 grav., Pittsburgh dist. prices excluded	5.875– 8.1	5.875– 8.1
CENTRAL MICHIGAN (FOB Central Mich. refinery group basis for shpt. within Mich.; shpts. may originate at plants outside Central group.)		
47-49 gravity w.w.	5.75 – 6	5.5 – 6
P.W. Distillate	5.5	5.5
No. 3 gas oil, Straw	5	5
U.G.I. gas oil	4.5 (2)	4.5 (2)
Fuel Oils (Vis. at 100).		
300-500 Vis	4.5 (1)	4.5 (1)
100-300 Vis	4.5	4.5
OHIO (S. O. quotations for statewide delivery)		
Kerosine	7	7
CALIFORNIA		
40-43 grav. w.w.	4.5 – 7	4.5 – 7
San Joaquin Valley:		
Heavy fuel	$0.85 (2)	$0.85 (2)
Light fuel	$0.95 (2)	$0.95 (2)
Diesel fuel	4 (2)	4 (2)
Stove dist.	5 (1)	5 (1)
Los Angeles:		
Heavy fuel	$0.80–0.85(2)	$0.80–$0.85 (2)
Light fuel	$0.85–0.95(2)	$0.85–$0.95 (2)
Diesel fuel	3.5 – 4(2)	3.5 – 4 (2)
Stove dist.	3 – 5(2)	3 – 5 (2)
San Francisco:		
Heavy fuel	$0.90 (1)	$0.90 (1)
Light fuel	$1.00 (1)	$1.00 (1)
Diesel fuel	4.5 (1)	4.5 (1)
Stove dist.	5.5 (1)	5.5 (1)

Note: All above heavy fuels meet Pacific specification 400; light fuel, spec. 300; Diesel fuels, spec. 200; and stove distillate, spec. 100.

Lubricating Oils

WESTERN PENNA.

Prices are for sales made, or offers reliably reported, to jobbers & compounders only.

Viscous Neutrals — No. 3 col. Vis. at 70° F.

200 Vis. (180 at 100°) 420-425 fl.		
0 p.t.	40.5 (1)	40.5 (1)
10 p.t.	39.5 (1)	39.5 (1)
15 p.t.	38.5 (1)	38.5 (1)
25 p.t.	33	33
150 Vis. (143 at 100°) 400-405 fl.		
0 p.t.	38.5 (1)	38.5 (1)
10 p.t.	37.5 (1)	37.5 (1)
15 p.t.	36.5(1)	36.5 (1)
25 p.t.	31	31
Cylinder Stocks		
Brt. stk., 145-155 vis. at 210°, 540-550 fl., No. 8 col.		
10 p.t.	30.5 (1)	30.5 (1)
15 p.t.	29.5 (1)	29.5 (1)
25 p.t.	25	25
600 S.R. filterable	15	15
650 S.R.	15.5	15.5
600 fl	16	16
630 fl	17	17

MID-CONTINENT (F. o. b. Tulsa)

Neutral Oils (Vis. at 100° F. 0 to 10 P.P.)

Pale Oils:

Vis. Color		
60-85—No. 2	8	8
86-110—No. 2	8.5	8.5
150—No. 3	14.5	14.5
180—No. 3	15	15
200—No. 3	15	15
250—No. 3	16–16.5	16–16.5
280—No. 3	17	17
300—No. 3	18	18

Lubricating Oils (Cont'd)

Prices In Effect	July 27	July 20
Red Oils:		
180—No. 5	15 (1)	15 (1)
200—No. 5	15 (1)	15 (1)
280—No. 5	No Price	No Price
300—No. 5	17.5 (2)	17.5 (2)

Note: Viscous Neutrals, 15-25 p.p. generally are quoted 0.5c under 0-10 p.p. oils. Non-viscous oils, 15-25 p.p.i generally are quoted 0.25c under 0-10 p.p. oils.

Bright Stock—Vis. at 210°		
200 Vis. D	27 (1)	27 (1)
150-160 Vis. D:		
0 to 10 p.p.	23	23
10 to 25 p.p.	22.5–23	22.5–23
25 to 40 p.p.	23(1)	23 (1)
150-160 Vis. E	22 (2)	22 (2)
120 Vis. D:		
0 to 10 p.p.	22 (2)	22 (2)
600 S.R. Dark Green	8.5(1)	8.5 (1)
600 S.R. Olive Green	10–11	10–11
631 S.R.	18.5 (1)	18.5 (1)
Black Oil	5.5 (1)	5.5 (1)

SOUTH TEXAS Neutral Oils

Vis. Color		
Pale Oils: (*Vis. at 100° F.*)		
100 No. 1½-2½	6.5	6.5
200 No. 2-3	8.75	8.75
300 No. 2-3	9.25	9.25
500 No. 2½-3½	10	10
750 No. 3-4	10.25	10.25
1200 No. 3-4	10.375	10.375
2000 No. 4	10.5	10.5
Red Oils:		
100 No. 5-6	6.5 (2)	6.5 (2)
200 No. 5-6	8.75	8.75
300 No. 5-6	9.25	9.25
500 No. 5-6	10	10
750 No. 5-6	10.25	10.25
1200 No. 5-6	10.375	10.375
2000 No. 5-6	10.5–11.5	10.5–11.5

CHICAGO (From Mid-Continent p.l. crude.)

Neutral oils (Vis. at 100° F. 0 to 10 p.p.)

Pale Oils

Vis. Color		
60-85—No. 2	9.5 (1)	9.5 (1)
86-110—No. 2	10 (1)	10 (1)
150—No. 3	15.5 (1)	15.5 (1)
180—No. 3	16 (1)	16 (1)
200—No. 3	16 (1)	16 (1)
250—No. 3	17 (1)	17 (1)
Red Oils:		
180—No. 5	16 (1)	16 (1)
200—No. 5	16 (1)	16 (1)
250—No. 5	17 (1)	17 (1)
280—No. 5	18 (1)	18 (1)
300—No. 5	18.5 (1)	18.5 (1)

Note: Viscous oils, 15 to 30 p.p. are quoted 0.5c lower; 60-85 and 86-110 No. 2 non-viscous oils, 15 to 30 p.p., 0.25c lower.

Unfiltered Steam Refined: (Viscosity at 210°)		
140	11.5 (1)	11.5 (1)
160	12.5 (1)	12.5 (1)
200	13.5 (1)	13.5 (1)
Bright stocks, 160 vis. at 210 No. 8 color:		
0 to 10 p.p.	24 (1)	24 (1)
15 to 25 p.p.	23.5(1)	23.5 (1)
30 to 40 p.p.	21.5 (1)	21.5 (1)
Filtered Cyl. Stock	15.5 (1)	15.5 (1)

Note: To obtain prices delivered in Chicago, add 0.25c per gal.

Natural Gasoline

(Group 3 & Breckenridge prices are to blenders on freight basis shown below. Shipments may originate in any Mid-Continent manufacturing district.)

FOB GROUP 3

Grade 26-70 ..... 2.875–3 (Qtns) 2.75 (Qtns.)

FOB BRECKENRIDGE

Grade 26-70 ..... 2.5–2.625 (Qtns) 2.375 (Qtns.)

CALIFORNIA (FOB plants in Los Angeles basin)

21 pound vapor pressure for blending 4.75–5.375 (2) 4.75–5.375 (2)

Naphtha and Solvent

Prices in Effect	July 27	July 20
(FOB Group 3)		
Stoddard solvent	6.625	6.625
Cleaners' naphtha	7.125	7.125
V. M. & P. naphtha	7.125	7.125
Mineral spirits	6.125	6.125
Rubber solvent	7.125	7.125
Lacquer diluent	7.375– 8.125	7.375– 8.125
Benzol Diluent	7.875– 8.625	7.875– 8.625
WESTERN PENNA.		
Bradford-Warren District:		
Stoddard Solvent	7.5 (1)	7.5 (1)
Other Districts:		
Untreated naphtha	7 (2)	7 (2)
Stoddard solvent	7.25 – 7.75	7.25 – 7.75
OHIO (S. O. quotations for statewide delivery): V.M.&P. naphtha, D.C. naphtha, Varnolene & Sohio solvent	10	10
Rubber solvent	9	9

Wax

White Crude Scale:

WESTERN PENNA. (Bbls. C.L.)		
122-124 A.m.p.	4.25	4.25
124-126 A.m.p.	4.25	4.25
OKLAHOMA (C.L., FOB Refinery)		
Semi-refined:		
128 AMP min., white, 50 kilo bags	No Price	No Price
132-134 AMP, bbls.	5.25 (1)	5.25 (1)

CHICAGO (FOB Chicago district refinery of one refiner, in bags, carloads. Carloads, slabs loose 0.4c less. Melting points are EMP (ASTM) methods; add 3° to convert into AMP.)

Fully refined:		
122-124 (bags only)	5.6	5.6
125-127	6	6
127-129	6.25	6.25
130-132	6.55	6.55
132-134	6.8	6.8
135-137	7.55	7.55

Petrolatums

WESTERN PENNA. (Bbls., carloads; tank cars, 0.5c per lb. less.)

Snow White	6.125– 7.25	6.125– 7.25
Lily White	5.375– 6.125	5.375– 6.125
Cream White	4.375– 5.375	4.375– 5.375
Light Amber	3.375– 3.875	3.375– 3.875
Amber	3.125– 3.625	3.125– 3.625
Red	3 – 3.5	3 – 3.5

Group 3 Freight Rates

To Division Headquarters Points of Standard Oil Co. of Indiana

(Cents Per Gal.)

	Gasoline Kerosine	*Distillate Fuel Oil	Gas Oil and or Residual Fuel Oil
Chicago, Ill.	2.508	2.508	2.516
Decatur, Ill.	2.244	2.244	2.442
Joliet, Ill	2.508	2.508	2.516
Peoria, Ill.	2.310	2.310	2.442
Quincy, Ill.	2.178	2.178	2.294
Indianapolis, Ind.	2.640	3.034	3.034
Evansville, Ind.	2.442	2.886	2.886
South Bend, Ind.	3.135	3.135	3.330
Detroit, Mich.	4.290	3.996	3.996
Grand Rapids, Mich.	3.828	3.828	3.922
Saginaw, Mich.	4.290	4.144	4.144
Green Bay, Wis.	2.838	2.838	3.182
Milwaukee, Wis.	2.706	2.706	2.738
La Crosse, Wis.	2.574	2.574	2.886
Minneapolis-St. Paul	2.574	2.574	2.886
Duluth, Minn.	2.838	2.838	3.256
Mankota, Minn.	2.574	2.574	2.886
Des Moines, Ia.	2.046	2.046	2.294
Davenport, Ia.	2.310	2.310	2.442
Mason City, Ia.	2.376	2.376	2.664
St. Louis, Mo.	2.046	2.046	2.072
Kansas City, Mo.	1.518	1.518	1.776
St. Joseph, Mo.	1.518	1.518	1.776
Fargo, N. D.	3.564	3.564	3.996
Huron, S. D.	3.036	3.036	3.330
Wichita			
From Ponca City	0.528	0.528	0.592
From Tulsa	0.858	0.858	0.962
From Cushing	0.792	0.792	0.888

*Not suitable for illuminating purposes.

SEABOARD PRICES EXPORT AND COASTWISE

(NOTE—Parenthetical figures after prices indicate number of companies quoting when less than three companies are quoting.)

NOTICE—Owing to great demand, refiners generally limit quotations to regular customers and refuse bids, though higher, from others. Refiners' prices and sales shown; bids reported in market leads

Atlantic Coast

(Prices are of refiners, FOB their refineries & their tanker terminals, & of tanker terminal operators FOB their terminals)—Prices In Effect July 27

MOTOR GASOLINE

District:	Min. 80 Oct. '39 Research (Max. 2 cc. Lead)	72-74 Oct. (ASTM)	68-70 Oct. (ASTM)
N. Y. Harb.	12.3 (1)	11.7 –12.7	11.7 (1)
N. Y. Harb., barges	12.2 (1)	11.6 –11.7	11.6 (1)
Albany	....	11.8 –12	....
Philadelphia	....	11.7 –12.2	11.7 (1)
Baltimore	....	11.45	11.35 (1)
Norfolk	....	11.2 –11.45	11 (2)
Wilmington, N. C.	....	11.2 –11.3	10.9 –11 (2)
Charleston	....	11.2 –11.3	10.6 –10.9 (2)
Savannah	....	10.75 –11.25	10.5 (1)
Jacksonville	....	10.775–10.9	10.5–10.775 (2)
Miami	....	10.775–10.9	10.4–10.775 (2)
Tampa	....	10 –10.9	10.5–10.775 (2)
Pensacola	....	7 –7.2 (1)	6.6 –6.8 (1)
Mobile	....	6.87 – 7.27	6.6 –6.8 (1)
New Orleans	....	6.25 – 6.75	....
Portland	....	12 –12.3	....
Boston	....	11.9 –12.2	12.2 (1)
Providence	....	11.9 –12.2	....

FUEL OILS

	KEROSINE and/or NO. 1 FUEL	No. 2	No. 3	No. 5	No. 6
N. Y. Harb.	7.7	7.8	7.8	$2.10 –2.25 (a)	$1.80
N. Y. Harb., barges	7.6	7.7	7.7	....	....
Albany	7.9	7.9	7.9	$2.40 (1)	$2.00 (1)
Philadelphia	7.8	7.8	7.8	$2.13 (2)	$1.80
Baltimore	7.8	7.8	7.8	....	$1.80
Norfolk	7.7 –7.8	7.8	7.8 (1)	....	$1.80 (2)
Wilmington, N. C.	7.65	7.8	....	....	....
Charleston	7.8	7.8 (2)	....	....	$1.75 (2)
Savannah	7.65	....	....	....	$1.75 (1)
Jacksonville	7.4	7.35 (2)	7.35 (1)	....	$1.75 (1)
Miami	7.65 (2)	....	....	....	....
Tampa	7.65	7.35 (2)	....	....	$1.70 (1)
Pensacola	4.8 (1)	....	....	....	....
Mobile	4.5 –4.75	....	....	....	....
New Orleans	4.25 – 4.45	3.75 –3.875 (2)	....	$1.25 (1)	$0.85 (1)
Portland	7.9	7.9	7.9 (2)	$2.40 (1)	$1.80 (2)
Boston	7.8	7.8	7.8 (2)	$2.10 (2)	$1.80
Providence	7.8	7.8	7.8	$2.05 –$2.10	$1.80

(a) This price is for a straight-run, low pour test No. 5 fuel.

	Bunker C Fuel Ships' bunkers (Ex Lighterage)	Diesel Oil Ships' bunkers (Ex Lighterage)	Diesel Oil Shore Plants	Gas House Gas Oil 28-34 Gravity
N. Y. Harbor	$1.80	$3.242	7.8 –7.9 (2)	7.9 (2)
Albany	$2.00 (1)	$3.442 (1)	7.9 (2)	8.1 (1)
Philadelphia	$1.80	$3.242	....	....
Baltimore	$1.80	$3.242	7.8 (1)	7.8 (1)
Norfolk	$1.80	$3.242	7.8 (1)	7.8 (1)
Charleston	$1.75	$3.242 (2)	7.8 (1)	7.8 (1)
Savannah	$1.75 (1)	$3.082 (1)	....	....
Jacksonville	$1.75 (2)	$3.082 (2)	....	....
Tampa	$1.70 (2)	$3.082 (2)	....	....
New Orleans	$0.85	$1.55 (2)	3.75 (1)	3.75 (1)
Portland	$1.80 (2)	$3.342 (2)	7.9 (1)	8 (1)
Boston	$1.80	$3.242	7.8 (2)	7.9 (2)
Providence	$1.80	$3.242 (2)	7.8 (1)	7.9 (1)

Wax

(Melting points are AMP, 3° higher than EMP. Prices are FOB refinery and do not include bag, freight or export differentials).

Prices in Effect July 27

Crude Scale:	New Orleans Export	N. Y. Domestic	N. Y. Export
124-6 Yellow	4.25 (1)	....	4.25 (1)
122-4 White	....	4.25	4.25
124-6 White	4.25 (1)	4.25	4.25
Fully Refined:			
123-5	5.2 (1)	5.2 (2)	5.2 (1)
125-7	5.2 (1)	5.2 (2)	5.2 (1)
128-30	5.6 (1)	5.6	5.6 (1)
130-32	5.85 (1)	5.85 (2)	5.85 (1)
133-5	6.15 (1)	6.15	6.15 (1)
135-7	6.4 (1)	6.4 (1)	6.4 (1)

Naphtha

Prices in Effect July 27

	V.M.&P. Naphtha	Mineral Spirits
New York Harbor	11 (2)	10
Philadelphia district	11 (2)	10
Baltimore	10.5 (2)	9.5
Boston	11.5 (2)	10.5
Providence	11.5 (1)	10.5 (2)

Pacific Export

(Quotations at seaboard, Los Angeles, cargo lots, except where otherwise noted.)

Prices In Effect	July 27	July 20
375 e.p. blend, 70 oct.	No Price	No Price
390 e.p. blend, 68 oct.	No Price	No Price
390 e.p. blend, 66 oct.	No Price	No Price
400 e.p. blend, 65 oct. min.	No Price	No Price
U. S. Motor, under 65 octane	No Price	No Price
38-40 grav., w.w. kero., 150 fire point	No Price	No Price
41-43 grav., w.w. kero.	No Price	No Price
44-grav. w.w. kero.	No Price	No Price
Diesel fuel, 24 & above	No Price	No Price
Diesel fuel, under 24	No Price	No Price
30-34 grav. diesel (gas oil) Pac. Spec. 200	No Price	No Price
Grade C fuel, Pac. Spec. 400	No Price	No Price
In Ship's Bunkers, or deep tank lots:		
Diesel fuel, Pac. Spec. 200	$1.40 –$1.45	$1.40 –$1.45
Grade C fuel, Pac. Spec. 400	$0.825–$0.85	$0.825–$0.85
Cased Goods: (Per case)		
375-400 e.p. blend, 65 oct. & above	No Price	No Price
400 e.p. blend, under 65 oct.	No Price	No Price
U. S. Motor	No Price	No Price
40-43 grav. w.w. kero., 150 fire point	No Price	No Price
Kero., p.w.	No Price	No Price

Tanker Rates

(Approximate last paid rates, cents per bbl.; Gulf-N. Atlantic, not East of N. Y.)

Hvy. Crude & Fuel (10 to 19.9 gravity)	48
Light Crude, (30 grav. or Lighter)	43
Gasoline	40
Kerosine	40
No. 2 Fuel	42

Note: 200% surcharge permitted on above rates by War Shipping Administration "to cover increased wartime operating expenses."

Gulf Coast

(Prices for sales made or firm offers reliably reported for sales pending in cargoes FOB ship at Gulf, for minimum of 20,000 bbls. Prices are by refiners only to other refiners, export agents, or to large tanker terminal operators at the customary trade specifications noted.)

Prices In Effect July 27

Domestic

Motor Gasoline	
Min. 80 oct. '39 Research, max. 2cc lead	5.5
60-62 Gravity, Max. 400 e.p.	
72-74 oct. leaded (ASTM)	5.125– 6
70 oct. unleaded "	5.25 – 5.75
68 oct. " "	5.25 – 5.5
65 oct. " "	5.25 – 5.75
60 oct. " "	5
41-43 w.w. kerosine	3.875– 4.375
No. 2 fuel	3.75 – 3.875
Gas Oil—Less than ½ of 1% sulfur.	
Below 43 diesel index	4
43-47 " "	4
48-52 " "	4
53-57 " "	4.125
58 & above diesel index	4.25
Diesel Oil, ship's bunkers (ex-lighterage)	$1.55–$1.68
Bunker C, " " "	$0.85–$0.95
Bunker C, cargoes	$0.85

Export

Motor Gasoline	
60-62 Gravity, Max. 400 e.p.	
72-74 oct. leaded (ASTM)	5.125– 6
70 oct. unleaded "	5.25 – 5.75
68 oct. " "	5.25 – 5.5
65 oct. " "	5.25 – 5.75
60 oct. " "	5
41-43 w.w. kerosine	3.875– 4.375
Gas Oil—Less than ½ of 1% sulfur.	
Below 43 diesel index	4
43-47 " "	4
48-52 " "	4
53-57 " "	4.125
58 & above diesel index	4.25

MID-CONTINENT LUBES

(At Gulf; in packages, FAS.; in bulk, FOB terminals)

Prices in Effect July 27

	Steel Drums	Bulk
200 vis. D 210 brt. stock	34–35 (2)	28.8 (2)
150 vis. D 210 brt. stock 0-10 p.p.	30-31 (2)	24.8 (2)
10-25 p.p.	29.5 (1)	24.3 (1)
100 vis. D 210 brt. stock 0-10 p.p.	29.5 (1)	24.3 (1)
10-25 p.p.	29 (1)	23.8 (1)
200 vis. No. 3 col. neutral: 0-10 p.p.	22 (1)	16.8 (1)

TANK WAGON PRICES

Commercial or consumer tank car, tank wagon, dealer, and service station prices for gasoline **do not include taxes;** *they do, however, include inspection fees as shown in general footnote. Gasoline taxes, shown in separate column, include 1.5c federal, and state taxes; also city and county taxes as indicated in footnotes. Kerosine tank wagon prices also do not include taxes; kerosine taxes where levied are indicated in footnotes. Dealer discounts are shown in footnotes. These prices in effect July 27, 1942 as posted by principal marketing companies at their headquarters offices, but subject to later correction.*

S. O. New Jersey

Esso (*Regular Grade*)

	Consumer Tank Wagon	Dealer T.W.	Gaso-line Taxes	Kero-sine T.W.
*Atlantic City, N. J.	12.7	13.2	4.5	10.3
*Newark, N. J.	12.7	13.2	4.5	10.3
Annapolis, Md.	13.05	13.55	5.5	12.1
Baltimore, Md.	12.45	12.95	5.5	11.1
Cumberland, Md.	13.85	14.35	5.5	12.6
Washington, D. C.	12.7	13.2	4.5	11.6
Danville, Va.	14.15	14.65	6.5	12.85
Norfolk, Va.	12.95	13.45	6.5	12.6
Petersburg, Va.	13.25	13.75	6.5	13.6
Richmond, Va.	13.25	13.75	6.5	13.6
Roanoke, Va.	14.45	14.95	6.5	13.1
Charleston, W. Va.	14.75	15.25	6.5	13.9
Parkersburg, W. Va.	14.05	14.55	6.5	13.6
Wheeling, W. Va.	14.05	14.55	6.5	14.2
Charlotte, N. C.	14.6	15.1	7.5	11.9
Hickory, N. C.	15.15	15.65	7.5	12.9
Mt. Airy, N. C.	15.0	15.5	7.5	12.1
Raleigh, N. C.	14.35	14.85	7.5	12.9
Salisbury, N. C.	14.65	15.15	7.5	13.3
Charleston, S. C.	13.45	13.95	7.5	....
Columbia, S. C.	14.3	14.8	7.5	....
Spartanburg, S. C.	15.0	15.5	7.5	....

	Mineral Spirits T.W.	V.M.&P. T.W.
Newark, N. J.	13	14.5
Baltimore, Md.	15.5	....
Washington, D. C.	15.5	....

Fuel Oils—T.W.	No. 1	No. 2	No. 3
Atlantic City, N. J.	10.3	9.8	9.8
Newark	10.3	9.8	9.8
Annapolis, Md.	....	10.05	....
Baltimore	10.1	9.8	9.8
Washington, D. C.	10.6	10.2	10.2
Norfolk, Va.	10.3	9.6	9.6
Petersburg	10.6	9.8	....
Richmond	10.6	9.8	9.8
Charlotte, N. C.	10.9	11.2	....
Hickory	....	10.8	....
Raleigh	11.9	10.9	....
Charleston, S. C.	....	9.8	....
Columbia	....	10.8	....
Spartanburg	....	11.6	....

*Effective June 29, '42, minimum retail resale price of 16.7c posted thru New Jersey.

Discounts:

Esso gasoline—to undivided dealers, 0.5c off dealer t.w.

Kerosine—1c off t.w. price for 25 gals. or more, under contract thru territory (Baltimore city contract not necessary) except no discount in state of New Jersey.

Naphthas—To buyers taking following quantities at one time: Newark, 2c per gal. on 200 gals. or more, less than 200 gals. 0.5c higher price; Baltimore, 2c off on 25 to 100 gals. and 3c on over 100 gals.; Washington, 2c off to contract buyers.

Socony-Vacuum Oil Co., Inc.

Socony Mobilgas (*Regular Grade*)

	Com. Cons. T.W.	Undiv. Dlr. T.W.	Gaso-line Taxes
New York City			
Manhattan & Bronx	12.6	13.1	*5.5
Kings & Queens	12.6	13.1	*5.5
Richmond	12.2	12.7	*5.5
Albany, N. Y.	12.4	12.9	5.5
Binghamton, N. Y.	13.5	14	5.5
Buffalo	12.7	13.2	5.5
Jamestown, N. Y.	12.9	13.4	5.5
Mt. Vernon, N. Y.	12.6	13.1	5.5
Plattsburg, N. Y.	13.5	14	5.5
Rochester, N. Y.	13.3	13.8	5.5
Syracuse, N. Y.	13	13.5	5.5
Bridgeport, Conn.	12.5	13	4.5
Danbury, Conn.	13	13.5	4.5
Hartford, Conn.	13.1	13.6	4.5
New Haven, Conn.	12.5	13	4.5
Bangor, Me.	13.2	13.7	5.5
Portland, Me.	12.8	13.3	5.5
Boston, Mass.	12.4	12.9	4.5
Concord, N. H.	13.9	14.4	5.5
Lancaster, N. H.	14.5	15	5.5
Manchester, N. H.	13.8	14.3	5.5
Providence, R. I.	12.5	13	4.5
Burlington, Vt.	13.4	13.9	5.5
Rutland, Vt.	13.5	14	5.5

	Mineral Spirits T.W.	V.M.&P. T.W.
Buffalo, N. Y.	12.4	13.6
New York City	11	12
Rochester, N. Y.	13.2	14.4
Syracuse, N. Y.	14	....
Boston, Mass.	12	13
Bridgeport, Conn.	†16.3	†17.3
Hartford, Conn.	†16.3	†17.3
Providence, R. I.	13	14

	Kero-sine Yard	Kero-sine TW	Mobil-fuel Diesel TC	Mobil-fuel Diesel TW	Mobil-heat Fuel Yard	Mobil-heat Fuel TW
New York:						
Manhat'n & Bronx	8	10.4	....	10.1	8.1	9.8
Kings & Queens	8	10.4	....	10.1	8.1	9.8
Richmond	7.9	10.4	....	....	8	9.6
Albany	8.1	10.1	8.1	10.1	8.1	9.8
Binghamton	9.5	11.5	....	11.5	9.5	11
Buffalo	9.2	11.2	9.1	11.1	9.3	10.8
Jamestown	9.3	11.3	....	11.4	9.4	10.8
Mt. Vernon	8.1	10.6	....	10.2	8.2	9.8
Plattsburg	8.7	10.7	....	10.7	8.7	10.2
Rochester	9.3	11.3	9	11	9	10.5
Syracuse	9.1	11.1	8.9	10.9	8.9	10.4
Conn.:						
Bridgeport	8.2	10.2	....	....	8.3	9.6
Danbury	8.7	10.7	....	....	8.6	9.6
Hartford	8.3	10.3	....	10.3	8.3	9.8
New Haven	8	10	....	10.1	8.1	9.7
Maine:						
Bangor	8.5	10.5	8.5	10.5	8.5	9.9
Portland	8.1	10.5	8.1	10.1	8.1	9.8
Mass.:						
Boston	8.2	10.4	8	10	8.2	9.8
N. H.:						
Concord	9	11	....	....	9.3	10.8
Lancaster	10.1	12.1	....	....	10.3	11.8
Manchester	9.1	11.4	....	....	9	10.5
R. I.:						
Providence	8.2	10.2	8	10	8.2	9.7
Vermont:						
Burlington	8.7	10.7	8.6	10.6	8.6	10
Rutland	8.9	10.9	....	10.8	8.8	10.3

*Does not include 1% city sales tax applicable to price of gasoline (ex tax).

†In steel barrels.

Discounts: Diesel—On t.w. deliveries, 0.5c for at least 400 gals.; 1c for full tank truck.

Atlantic Refining

Atlantic White Flash Gasoline (*Regular Grade*)

	Commer-cial T.W.	Dealer T.W.	Gaso-line Taxes	Kero-sine T.W.
Philadelphia, Pa.	12.7	13.2	5.5	12.55
Pittsburgh	13.2	13.7	5.5	12.9
Allentown	13.2	13.7	5.5	12.9
Erie	13.2	13.7	5.5	12.9
Scranton	13.2	13.7	5.5	12.9
Altoona	13.2	13.7	5.5	12.9
Emporium	13.2	13.7	5.5	12.9
Indiana	13.2	13.7	5.5	12.9
Uniontown	13.2	13.7	5.5	12.9
Harrisburg	13.2	13.7	5.5	12.9
Williamsport	13.2	13.7	5.5	12.9
Dover, Del.	....	13.7	5.5	12.9
Wilmington, Del.	....	13.2	5.5	12.4
Boston, Mass.	....	13.4	4.5	10.4
Springfield, Mass.	....	14.3	4.5	11.3
Worcester, Mass.	....	14	4.5	10.9
Fall River, Mass.	....	13.5	4.5	11
Hartford, Conn.	....	14.1	4.5	10.3
New Haven, Conn.	....	13.5	4.5	11.4
Providence, R. I.	....	13.5	4.5	11
Atlantic City, N. J.	....	13.2	4.5	10.3
Camden, N. J.	....	13.2	4.5	10.3
Trenton, N. J.	....	13.2	4.5	10.3
Annapolis, Md.	....	13.55	5.5	11.1
Baltimore, Md.	....	12.95	5.5	10.1
Hagerstown, Md.	....	14.05	5.5	10.6
Richmond, Va.	....	13.75	6.5	12.6
Wilmington, N. C.	....	14.05	7.5	12.2
Brunswick, Ga.	....	12.9	7.5	*11.4
Jacksonville, Fla.	....	12.9	8.5	12.4

	Mineral Spirits T.W.†	V.M.&P. T.W.†
Philadelphia, Pa.	11	12.5
Lancaster, Pa.	12	13.5
Pittsburgh, Pa.	12.5	13.5

Fuel Oils—T.W.	1	2	3	5	6
Phila., Pa.	10.4	9.8	9.8	5.82	4.82
Allentown, Pa.	10.9	10.1	10.1	....	....
Wilmington, Del.	10.4	9.8	9.8	....	....
Springfield, Mass.	11.3	10.2	10.2	....	....
Worcester, Mass.	10.9	10.1	10.1	....	....
Hartford, Conn.	10.3	9.8	9.8	....	....

*Does not include 1c Georgia kerosine tax.

†Mineral Spirits prices also apply to Stoddard Solvent; V.M.&P. prices also apply to Light Cleaners Naphtha.

Discounts:

Gasoline—to undivided dealers, 0.5c off dealer t.w., except Georgia & Florida dealer t.w. and undivided dealer t.w. prices are same.

Kerosine—Thru Penna. & Delaware, 2c off t.w. price on t.w. deliveries of 25 gals. or more at one time.

S. O. Ohio††

***Sohio X-70 Gasoline (*Regular Grade*)**

	Con-sumer T.W.	**Re-sellers	‡S.S.	Gaso-line Taxes	†Kero-sine T.W.
Ohio, Statewide	12	10	13.5	5.5	9
Akron	12	9.5	12.5	5.5	9
Cincinnati	12	9.5	12.5	5.5	9
Cleveland	12	9.5	12.5	5.5	9
Columbus	12	9.5	12.5	5.5	9
Dayton	12	9.5	12.5	5.5	9
Marietta	12	9.5	12.5	5.5	9
Portsmouth	12	9.5	12.5	5.5	9
Toledo	12	9.5	12.5	5.5	9
Youngstown	12	9.5	12.5	5.5	9

Aviation Gasoline—Statewide

	Consumer T.W.	Gasoline Taxes
Sohio Aviation	14.5	6.5
Esso Ethyl Aviation 73 Oct.	15.5	5.5
Esso Ethyl Aviation 80 Oct.	16.5	5.5
Esso Ethyl Aviation 91 Oct.	17.5	5.5
Esso Ethyl Aviation 100 Oct.	24.5	5.5

†Naphtha—T.W.

	State-wide	Lucas County
S. R. Solvent	13.5	13.5
D. C. Naphtha	14.5	14.25
V.M.&P. Naphtha	14.5	14.25
Varnolene	14.5	14.25
Sohio Solvent	14.5	14.25

Fuel Oils—T.W.	No. 1	No. 2	No. 3	No. 4
Ohio, Statewide	8	8	7.5	....
Cleveland	10	10	9.5	7.25

*Renown (third-grade) prices are same as X-70 unless otherwise noted.

**Except authorized agents.

†Kerosine prices are ex 1c state tax. Naphtha prices are ex 1.5c federal & 4c state tax.

‡Prices at company-operated stations.

††Statewide prices are subject to exceptions other than those shown.

Discounts:

Esso aviation—on contract to hangar operators and resellers, 2c off consumer t.w.

Fuel oils—Statewide prices are for t.w. & drum deliveries of 50 gals. or more; prices for deliveries of less than 50 gals. are 0.5c higher. Cleveland Nos. 1, 2, and 3 prices are for bulk deliveries of 5 to 99 gals.; 100 gals. and over are 2c less. Cleveland No. 4 price is for full compartment hose dump only.

Naphthas—to contract consumers off t.w. prices—Statewide: 300 to 999 gals., 0.5c; 1000 to 2499 gals., 0.75c; 2500 to 4999 gals., 1c; 5000 or more gals., 1.5c. Lucas County: Less than 50 gals., tank wagon price; 50 to 249 gals., 0.5c; 250 to 499 gals., 1c; 500 gals or over, 1.5c.

S. O. Kentucky

Crown Gasoline (*Regular*)
Standard (*Third Grade*)

	†Net Dealer Crown	Standard	Gaso-line Taxes	Kero-sine T.W.
Covington, Ky.	9.5	8.5	6.5	9
Lexington, Ky.	10.5	8.5	6.5	9
Louisville, Ky.	10	9	6.5	8.5
Paducah, Ky.	9	8	6.5	8.5
Jackson, Miss.	10	9	7.5	*8.5
Vicksburg, Miss.	9.5	8.5	7.5	*8
Birmingham, Ala.	10	9	*8.5	9
Mobile, Ala.	9	7	*9.5	8.5
Montgomery, Ala.	10	9	*9.5	*9
Atlanta, Ga.	13.9	....	7.5	*11.4
Augusta, Ga.	13.9	....	7.5	*10.9
Macon, Ga.	13.9	....	7.5	*11.4
Savannah, Ga.	12.9	....	7.5	*10.4
Jacksonville, Fla.	12.9	....	8.5	10.4
Miami, Fla.	12.9	....	8.5	10.4
Pensacola, Fla.	9	8	*9.5	8
Tampa, Fla.	12.9	....	*9.5	10.4

*Taxes: In tax column are included these city and county gasoline taxes: Mobile, 2c city; Birmingham, 1c city; Montgomery, 1c city and 1c county; Pensacola, 1c city. Georgia and Montgomery, Ala. have 1c kerosine tax, Mississippi 0.5c, not included in above prices.

†Consumer t.w. prices are same as net dealer prices.

S. O. Indiana

Red Crown (*Regular Grade*)
Blue Crown (*Third Grade*)
Dealer Prices

	Red Crown Cons. T.W	Red Crown	Blue Crown	Gaso-line Taxes	Kero-sine T.W.
Chicago, Ill.	10.9	8.9	8.4	4.5	10.3
Decatur, Ill.	9.1	7.1	7.1	4.5	9.5
Joliet, Ill.	11.9	9.6	8.5	4.5	10.3

(Continued on next page)

Above prices include these inspection fees on both gasoline and kerosine unless otherwise specified, per gallon:
Alabama 1/40c on gasoline, 1/2c on kerosine; Arkansas 1/20c; Florida 1/8c; Illinois 3/100c; Indiana 1/5c in lots of 25 bbls. or less, 2/25c in lots of more than 24 bbls.; Kansas 1/50c; Louisiana 1/32c; Minnesota 7/200c; Missouri 1/50c; Nebraska 3/100c; Nevada, gasoline 1/20c; North Carolina 1/4c; North Dakota 1/20c; Oklahoma 2/25c; South Carolina 1/8c; South Dakota 1/20c; Tennessee 2/5c; and Wisconsin 3/100c.
Kerosine inspection fees only: Iowa 3/50c; Michigan 1/5c per gal.

TANK WAGON PRICES

Commercial or consumer tank car, tank wagon, dealer, and service station prices for gasoline **do not include taxes;** *they do, however, include inspection fees as shown in general footnote. Gasoline taxes, shown in separate column, include 1.5c federal, and state taxes; also city and county taxes as indicated in footnotes. Kerosine tank wagon prices also do not include taxes; kerosine taxes where levied are indicated in footnotes. Dealer discounts are shown in footnotes. These prices in effect July 27, 1942 as posted by principal marketing companies at their headquarters offices, but subject to later correction.*

S. O. Indiana (Cont'd)

Red Crown (*Regular Grade*)
Blue Crown (*Third Grade*)

Dealer Prices

	Red Crown Cons. T.W.	Red Crown T.W.	Blue Crown	Gasoline Taxes	Kerosine T.W.
Peoria, Ill.	10.7	9.2	9.1	4.5	10.1
Quincy, Ill.	8.9	7.9	7.9	4.5	10
Indianapolis, Ind.	11.6	9.7	9.6	5.5	*9.8
Evansville, Ind.	11.4	9.9	7.9	5.5	*9.6
South Bend, Ind.	12	10.5	10	5.5	*10.2
Detroit, Mich.	11.4	9.9	9.4	4.5	9.6
Grand Rapids, Mich.	9.6	8.1	8.1	4.5	9.6
Saginaw, Mich.	11.4	9.9	9.4	4.5	9.6
Green Bay, Wis.	12.2	10.7	9.7	5.5	10.6
Milwaukee, Wis.	12.1	10.6	10.1	5.5	10.5
La Crosse, Wis.	11.9	10.4	9.9	5.5	10.3
Minneapolis-St. Paul	11.9	9.9	9.5	5.5	10.3
Duluth, Minn.	12.2	10.7	10.2	5.5	10.6
Mankato, Minn.	11.9	10.4	9.5	5.5	10.3
Des Moines, Ia.	11.4	9.9	9.4	4.5	*9.8
Davenport, Ia.	11.7	10.2	9.7	4.5	*10.1
Mason City, Ia.	11.7	10.2	9.7	4.5	*10.1
St. Louis, Mo.	10.3	8.8	8.6	*4.5	9.8
Kansas City, Mo.	10.4	8.9	7.9	*4.5	9.4
St. Joseph, Mo.	9	9	8	*4.5	9.6
Fargo, N. D.	12.9	11.4	10.5	5.5	11.3
Huron, S. D.	12.3	10.8	10.3	5.5	10.7
Wichita, Kans.	10.3	8.2	6.5	4.5	8

Stanavo Aviation 73 Octane

Chicago, Ill.	15.7	4.5
Milwaukee, Wis.	15.9	5.5
Minneapolis, Minn.	15.7	5.5
St. Louis, Mo.	15.2	*4.5
Kansas City, Mo.	14.8	*4.5
Fargo, N. D.	16.7	5.5
Huron, S. D.	16.1	5.5

	Oleum Spirits	V.M.&P. Naphtha	Stanisol	*Taxes
(Prices are base prices before discounts)				
Chicago,	13.5	13.8	12.8	4.5
Detroit	15.8	15	16.3	4.5
K. C., Mo.	13.3	14.3	13.8	1.5
St. Louis, Mo.	13.7	14.7	13.2	1.5
Milwaukee	14.4	15.4	14.9	5.5
Minneap'lis	14.2	15.2	13.5	5.5

Fuel Oils T. W.

Chicago

	Standard Heater Oil
1-99 gals.	9
100-149 gals.	8
150 gals. & over	7.5

	Stanolex Fuel Oil No. 1	Stanolex Furnace Oil
1-99 gals.	8.5	8.5
100-149 gals.	7.5	7.5
150-399 gals.	7.5	7.5
400 gals. & over	7	7

	Stanolex Fuel Oil A	Stanolex Fuel Oil B
1-99 gals.	8	8
100-399 gals.	7	7
400-749 gals.	6	6
750 gals. & over	5.25	5.25

	Stanolex Bunker C Fuel Oil
1-399 gals.	6.5
400-999 gals.	5.5
1000 gals. & over	4.5

Other Points: Indianapolis	Stanolex No. 1	Stanolex Furnace Oil
1-99 gals.	....	*8.7
100 gals. & over	....	*7.7
Detroit		
1-99 gals.	....	7.8
100 gals. & over	....	6.8
Milwaukee		
1-99 gals.	....	8.7
100 gals. & over	....	7.7
Minneapolis		
1-99 gals.	....	8.5
100 gals. & over	....	7.5
St. Louis		
1-99 gals.	8.3	7.8
100 gals. & over	7.3	6.8
Kansas City		
1-99 gals.	....	7.6
100 gals. & over	....	6.6

*Taxes: In gasoline tax column are included these city taxes—Kansas City, St. Joseph, and St. Louis, 1c. Indiana kerosine and fuel oil prices are ex 4c state tax; Iowa kerosine prices are ex 3c state tax. In naphtha tax column are included 1.5c federal tax and state taxes.

S. O. Nebraska

(*Regular Grade*)

	T.W. Dealer	Gasoline Taxes	Kerosine T.W.
Omaha	11.4 8.9	6.5	9.8
McCook	10.5 9.4	6.5	9
Norfolk	11.9 10.4	6.5	10.3
North Platte	11 9.9	6.5	10
Scottsbluff	12.4 9.5	6.5	9.5

S. O. Louisiana

Esso Gasoline (*Regular Grade*)

	Consumer Tank Wagon	Dealer T.W.	Gasoline Taxes	Kerosine T.W.
New Orleans, La.	8.75	9.25	8.5	*9
Baton Rouge, La.	8.75	9.25	8.5	*9.5
Alexandria, La.	8.75	9.25	8.5	*9.5
Lafayette, La.	9	9.5	8.5	*9
Lake Charles, La.	9	9.5	8.5	*11
Shreveport, La.	8.5	9	8.5	*8
Knoxville, Tenn.	9.5	10	8.5	12.5
Memphis, Tenn.	7.90	8.40	8.5	10.5
Chattanooga, Tenn.	10.5	11	8.5	11
Nashville, Tenn.	10.5	11	8.5	10
Bristol, Tenn.	13.45	13.95	8.5	14
Little Rock, Ark.	9.5	10	8	10

*Louisiana kerosine prices are ex 1c state tax.

Discounts:

Esso Gasoline—To undivided dealers, 0.5c off dealer t.w.

Humble Oil & Refining Co.

Humble Motor Fuel (*Regular Grade*)
Thriftane (*Third Grade*)

	Humble *Tank Wagon	Humble Retail	Thriftane *Tank Wagon	Thriftane Retail	Gasoline Taxes
Dallas, Tex.	8.5†	10.5	7.5†	8.5	5.5
Ft. Worth, Tex.	8.5††	10.5	7.5‡	9	5.5
Houston, Tex.	8.5	12.5	7.5	10.5	5.5
San Antonio, Tex.	8.5	12.5	7.5	10.5	5.5

	Kerosine *Tank Wagon	Kerosine Retail
Dallas, Tex.	7	11
Ft. Worth, Tex.	7	11
Houston, Tex.	8	11
San Antonio, Tex.		10

	Tank Car
74 Oct. Aviation Gasoline, Clear FOB Baytown, Tex.	8.5

*To all classes of dealers & consumers.
†Less 1c allowance to dealers only.
‡Less 1½c allowance to dealers only.
††Less 2c allowance to dealers only.

The Texas Co.

	Gasoline—Dealer Fire-Chief (*Regular*)	T.W. Indian (*3rd Grade*)	Gasoline Taxes
Dallas, Tex.	8.5*	7.5*	5.5
Ft. Worth, Tex.	8.5†	7.5**	5.5
Wichita Falls, Tex.	8.5	7.5	5.5
Amarillo, Tex.	8.5	7.5	5.5
Tyler, Tex.	8.5*	7.5*	5.5
El Paso, Tex.	9.5	8.5	5.5
San Angelo, Tex.	8.5	7.5	5.5
Waco, Tex.	8*	7*	5.5
Austin, Tex.	8.5	7.5	5.5
Houston, Tex.	8.5	7.5	5.5
San Antonio, Tex.	8.5	7.5	5.5
Port Arthur, Tex.	8.5	7.5	5.5

*Less 1c temporary allowance to all dealers.
**Less 1.5c temporary allowance to all dealers.
†Less 2c temporary allowance to all dealers.

Continental Oil Co.

(N.B. Prices are Continental's "structural" prices. Prices do not reflect temporary reductions made to meet local competition).

	Conoco Bronz-z-z (*Regular*) †Tank Wagon	Demand (*3rd Grade*)	Gasoline Taxes	Kerosine T.W.
Denver, Col.	11	10	5.5	11
Grand Junction, Col.	12	11	5.5	12
Pueblo, Col.	10.5	9.5	5.5	10.5
Casper, Wyo.	11.5	10.5	5.5	12
Cheyenne, Wyo.	11	10	5.5	11.5
Billings, Mont.	12.5	11.5	6.5	12.5
Butte, Mont.	13.5	12.5	6.5	13.5
Great Falls, Mont.	12.5	11.5	6.5	12.5
Helena, Mont.	13	12	6.5	13
Salt Lake City, Utah.	13.5	12.5	5.5	14.5
Boise, Ida.	14.1	13.1	6.5	16.5
Twin Falls, Ida.	15.6	14.6	6.5	17
Albuquerque, N. M.	10.5	9.5	*7	10
Roswell, N. M.	10	9	*7	9.5
Santa Fe, N. M.	10.5	9.5	*7.5	10
Ft. Smith, Ark.	9.5	9.25	*7	9.5
Texarkana, Ark.	9	8	*5.5	9
Muskogee, Okla.	9.5	8.5	7	8.5
Oklahoma City, Okla.	9.5	8.5	7	8.5
Tulsa, Okla.	9.5	8.5	7	8.5

*Taxes: In gasoline tax column are included these city taxes—Albuquerque, & Roswell, 0.5c; Santa Fe, 1c. Texas 4c state tax applies within city limits of Texarkana, Ark.; Okla. 5.5c state applies within city limits of Ft. Smith, Ark.

†To consumers & dealers.

S. O. California

Standard Gasoline (*Regular Grade*)
Flight Gasoline (*Third Grade*)

	Standard Posted Net Tank Truck	Standard Retail	Flight Posted Net Tank Truck	Flight Retail	Gasoline Taxes
San Francisco, Cal.	10	14	9	12	4.5
Los Angeles, Cal.	9.5	13.5	8.5	11.5	4.5
Fresno, Cal.	11	15	10	13	4.5
Phoenix, Ariz.	12	16	10	13	6.5
Reno, Nev.	12	16	11	14	5.5
Portland, Ore.	10.5	14.5	9.5	12.5	6.5
Seattle, Wash.	10.5	14.5	9.5	12.5	6.5
Spokane, Wash.	12.5	16.5	11.5	14.5	6.5
Tacoma, Wash.	10.5	14.5	9.5	12.5	6.5

Std. Aviation 73

	Posted Net Tank Truck	Gasoline Taxes	Kerosine Tank Truck
San Francisco, Cal.	12.5	4.5	11.5
Los Angeles, Cal.	12	4.5	10
Fresno, Cal.	13.5	4.5	12.5
Phoenix, Ariz.	14.5	6.5	12.5
Reno, Nev.	14.5	5.5	13.5
Portland, Ore.	13	6.5	13.5
Seattle, Wash.	13	6.5	13.5
Spokane, Wash.	16	6.5	16.5
Tacoma, Wash.	13	6.5	13.5

Resale & Commercial: T.C. deliveries 0.25c per gal. off posted net tank truck.

Commercial: Retail deliveries, and /or tank truck deliveries of less than 40 gals., 4c per gal. above posted net tank truck price for Standard Aviation and Standard Gasoline, and 3c per gal. above posted net tank truck for Flight Gasoline, except single deliveries, of less than 40 gals. to Marine trade only, which are billed at posted net tank truck price.

Canada

PRICES ON IMPERIAL OIL, LTD.

Per Imperial Gallon, which is 1.2 U. S. Gallons

3-Star Imperial Gasoline (*Regular Grade*)

	†Gasoline T.W.	*Gasoline Taxes	†Kerosine T.W.
Hamilton, Ont.	17.5	11	18
Toronto, Ont.	17.5	11	18
Brandon, Man.	21	10	23
Winnipeg, Man.	20.5	10	22.5
Regina, Sask.	18	10	20
Saskatoon, Sask.	20.8	10	22.8
Edmonton, Alta.	18.9	10	20.9
Calgary, Atla.	16	10	18
Vancouver, B. C.	15	10	24
Montreal, Que.	17	11	17.5
St. John, N. B.	16.5	13	19
Halifax, N. S.	16.5	13	19

*Includes 3c Federal, and Provincial taxes.
†To divided & undivided dealers.

Above prices include these inspection fees on both gasoline and kerosine unless otherwise specified, per gallon:
Alabama 1/40c on gasoline, 1/2c on kerosine; Arkansas 1/20c; Florida 1/8c; Illinois 3/100c; **Indiana** 1/5c in lots of 25 bbls. or less, 2/25c in lots of more than 25 bbls.; **Kansas** 1/50c; Louisiana 1/32c; Minnesota 7/200c; Missouri 1/50c; Nebraska 3/100c; Nevada, gasoline 1/20c; North Carolina 1/4c; North Dakota 1/20c; Oklahoma 2/25c; South Carolina 1/8c; South Dakota 1/20c; Tennessee 2/5c; and Wisconsin 3/100c.
Kerosine inspection fees only: Iowa 3/50c; Michigan 1/5c per gal.

CRUDE OIL PRICES

Prices in $ per bbl. of 42 U. S. gals. at the well. A. P. I. gravity. Prices are effective as of 7 a. m. of dates shown

EASTERN & CENTRAL STATES FIELDS

PENNSYLVANIA GRADE

Posted by Jos. Seep Purch. Agency (Mar. 26, '42)

Bradford-Allegany $3.00
Southwest Penna $2.65
Eureka (West Va.) $2.59
Corning, O. (May 27, '41) $1.31

Posted by The Pennzoil Co. (Mar. 26, '41)

National Transit $2.93*

Posted by Valvoline Pipe Lines (Mar. 26, '42)

Bradford (Elk & McKean Counties, (Pa.) $3.00
Warren, Forest, Venango, Clarion & Butler Counties, Pa $2.93
Alleghany, Beaver, Washington & Greene Counties, Pa $2.65
West Virginia $2.59
Southeastern Ohio $2.55

*Applies to Cochran, Franklin, Hamilton & Doolittle districts; prices in other lower districts range down to $2.88 per bbl. at well.

MICHIGAN

Posted by Pure Oil Co. (May 27, '41)

Midland, Midland County $1.44
Sherman $1.39

Posted by Simrall Corp. (May 27, '41)

Greendale, Porter, Vernon, Crystal & Wise $1.44
Buckeye, Bentley, Edenville, Beaverton & Monitor (sweet crude type) $1.42
Freeman, Redding, Lincoln & Winterfield $1.39
West Branch-Arenac $1.24
Hamilton-Grout $1.29

Posted by Sohio Corp. (Mich. Div.)

Traverse crude in Allegan, Kent, Ottawa & Van Buren Cos. (June 2, '41) $1.45
Trenton crude, Monroe Co. (June 2, '41) $1.39

Posted by Bay Pipe Line Corp. (May 27, '41)

Saginaw & Wise $1.44
Buckeye, Bentley & Kawkawlin $1.42
Clare $1.11
Adams (June 1, '41) $1.27

ILLINOIS-INDIANA-KENTUCKY-OHIO

Posted by Sohio Corp. (May 21, '41)

Illinois Basin, including Griffin pool $1.37
Carmi, Storms, Ill. area $1.32
Birk City, Ky. area $1.32
Corydon, Ky. area, Henderson $1.32

Posted by Ohio Oil Co. (May 21, '41)

Illinois Basin $1.37
Eastern Ill. & Western Ind $1.22

Posted by Carter Oil Co. (May 21, '41)

Loudon, Fayette Co. Ill. $1.37

Posted by Mohawk Oil Lines, Inc. (May 21, '41)

Southern Illinois $1.37

Posted by Ashland Oil & Transp. Co. Somerset oil in Ash. Lines, Ky.: (June 19, '41)

Big Sandy River $1.38
Kentucky River $1.43

Posted by Ownesboro-Ashland Co.

Owensboro, Ky. area (May 21, '41) $1.32

Posted by S. O. Ohio (Sept. 1, '41)

Lima, Ohio $1.25
Cleveland, Lodi & Chatham (O). areas $1.30

MID-CONTINENT

OKLAHOMA-KANSAS-NORTH TEXAS

(See below for companies posting and dates)

Gravity	Schedule No. 1	Schedule No. 2	Schedule No. 3
Below 21	$0.85	$0.75	$0.81
21-21.9	.87	.78	.83
22-22.9	.89	.81	.85
23-23.9	.91	.84	.87
24-24.9	.93	.87	.89
25-25.9	.95	.90	.91
26-26.9	.97	.93	.93
27-27.9	.99	.96	.95
28-28.9	1.01	.99	.97
29-29.9	1.03	1.02	.99
30-30.9	1.05	1.05	1.01
31-31.9	1.07	1.07	1.03
32-32.9	1.09	1.09	1.05
33-33.9	1.11	1.11	1.07
34-34.9	1.13	1.13	1.09
35-35.9	1.15	1.15	1.11
36-36.9	1.17	1.17	1.13
37-37.9	1.19	1.19	1.15
38-38.9	1.21	1.21	1.17
39-39.9	1.23	1.23	1.19
40 & above	1.25	1.25	1.21

Above schedules posted by:

No. 1: **S. O. Indiana** May 20, '41 in Okla. & Kans. **Sinclair-Prairie** May 20, '41 in Okla. & Kans. beginning with 25-25.9. **Continental** May 19, '41 in Okla. & Kans. beginning with Below 29 at $1.01. **Texaco** May 19, in Okla. & Kans. beginning with 28-28.9.

No. 2: **Carter** May 20, '41 in Okla. **Shell** Dec. 5, '41 in Okla. & Kans. **Magnolia** May 21, '41 in Okla.

No. 3: All Dec. 11, '41: **Stanolind & Continental** in N. Tex. **Sinclair-Prairie** in N. Central Tex. **Magnolia & Texaco** in N. & N. Central Tex. **Continental, Magnolia & Sinclair-Prairie** schedules begin with Below 29 at $0.97. **Texaco** schedule begins with 28-28.9.

TEXAS & NEW MEXICO FIELDS

Posted by Humble Oil & Refining Co.

(May 21, '41, except Panhandle, Tex. July, 9 '41 and W. Central Texas Dec. 11, '41)

Gravity	Refugio	Texas Gulf Coast	Miran-do	Ana-huac	Dick-inson	East Central Texas	West Central Texas	Pan-handle, Texas	W. Texas & New Mex.	Hawkins Texas
Below 20	$1.08	$1.06	$1.03	$0.98	$0.93	....	....	$0.73	$0.70	$0.80
20-20.9	1.10	1.08	1.05	1.00	.95	....	....	.75	.72	.82
21-21.9	1.12	1.10	1.07	1.02	.97	....	....	.77	.74	.84
22-22.9	1.14	1.12	1.09	1.04	.99	....	....	.79	.76	.86
23-23.9	1.16	1.14	1.11	1.06	1.01	....	....	.81	.78	.88
24-24.9	1.18	1.16	1.13	1.08	1.03	....	....	.83	.80	.90
25 & above	....	....	....	....	....	....	....	....	....	.92
25-25.9	1.20	1.18	1.15	1.10	1.05	$0.97	$0.91	.85	.82	....
26-26.9	1.22	1.20	1.17	1.12	1.07	.99	.93	.87	.84	....
27-27.9	1.24	1.22	1.19	1.14	1.09	1.01	.95	.89	.86	....
28-28.9	1.26	1.24	1.21	1.16	1.11	1.03	.97	.91	.88	....
29-29.9	1.28	1.26	1.23	1.18	1.13	1.05	.99	.93	.90	....
30-30.9	1.30	1.28	1.25	1.20	1.15	1.07	1.01	.95	.92	....
31-31.9	1.32	1.30	1.27	1.22	1.17	1.09	1.03	.97	.94	....
32-32.9	1.34	1.32	1.29	1.24	1.19	1.11	1.05	.99	.96	....
33-33.9	1.36	1.34	1.31	1.26	1.21	1.13	1.07	1.01	.98	....
34-34.9	1.38	1.36	1.33	1.28	1.23	1.15	1.09	1.03	1.00	....
35-35.9	1.40	1.38	1.35	1.30	1.25	1.17	1.11	1.05	1.02	....
36-36.9	1.42	1.40	1.37	1.32	1.27	1.19	1.13	1.07	1.04	....
37-37.9	1.44	1.42	1.39	1.34	1.29	1.21	1.15	1.09	1.06	....
38-38.9	1.46	1.44	1.41	1.36	1.31	1.23	1.17	1.11	1.08	....
39-39.9	1.48	1.46	1.43	1.38	1.33	1.25	1.19	1.13	1.10	....
40 & above	1.50	1.48	1.45	1.40	1.35	1.27	1.21	1.15	1.12	....

Refugio: Includes crude purchased in East White Point, Greta, Melon Creek, O'Connor-McFaddin, Plymouth, Saxet, Taft, & Tom O'Connor fields.

Texas Gulf Coast: Includes crude purchased in Amelia, Clear Lake, Goose Creek, Hastings, Maguet, Mykawa, Mykawa New, Raccoon Bend, South Thompsons, Sugarland, Thompsons, & Webster fields.

Mirando: Includes crude purchased in Blanchard, Bridwell, Colorado, Comitas, Eagle Hill, Escobas, Fitzsimmons, Glen, Government Wells (North & South), Heyser, Hoffman, Kelsey, Kohler, Loma Novia, Lundell, Manilla, Mirando Valley, Placedo, Randado, Sarnosa, & Tesoro fields.

Anahuac: Includes crude purchased in Anahuac, Angleton, Cedar Point, Fishers' Reef, Hull, (Old & New), Pierce Junction, Red Fish Reef, & Turtle Bay fields.

Dickinson: Includes crude purchased in Dickinson, Gillock, Hardin, League City, & Rowan fields.

East Central Texas: Includes crude purchased in Anderson, Cherokee, Limestone, & Navarro Counties, and Navarro Crossing field.

West Central Texas: Includes crude purchased in Brown, Callahan, Comanche, Eastland, Fisher, Haskell, Jones, Shackelford, Stephens, & Throckmorton Counties.

Panhandle, Texas: Includes crude purchased in Carson, Gray, Hutchinson & Wheeler Counties.

West Texas & New Mexico: Includes crude purchased in Andrews, Crane, Crockett, Ector, Gaines, Glasscock, Howard, Reagan, Upton, Winkler, & Yoakum Counties, Texas; Lea County, N. M.

Hawkins: Includes crude purchased in Hawkins Field, Wood County, Texas.

Conroe $1.43
Tomball 1.40
Van 1.08
Talco 0.79
East Texas & Flag Lake $1.25
Flour Bluff, E. Flour Bluff 1.33
Salt Flat, N. Salt Flat 1.14
Darst Creek, Hilbig, Carroll 1.14
Clark, Zoboroski $1.14
Alice, Benavides (N. Sweden), Sun 1.35
Ben Bolt, Clark-Muil, Tom Graham 1.35
Yates (Pecos) 0.95
La Rosa 1.33

MAGNOLIA PETROLEUM CO.

(May 21, '41)

Panhandle, Tex.—(July 9, '41)—Same as Humble except Magnolia begins with below 29 at $0.91.

West Texas—In Crane, Upton, Howard, Glasscock, Mitchell, Winkler, Cochran, Hockley, Yoakum & Gaines Cos., and in Pecos & Andrews Cos. beginning Apr. 1, '42—Same as Humble except Magnolia begins with Below 25 at $0.80.

N. Mexico—In Lea Co.—Same as Humble except Magnolia begins with Below 25 at $0.88 & ends with 36 & above at $1.04.

Cass & Panola Cos., Tex.—Below 25 at $0.88, plus 2c per degree of gravity to 40 & above at $1.20.

Mirando, Tex.—Same as Humble.

East Texas $1.25
Darst Creek 1.14
Luling 1.05
Talco ..... .79
Lytton Springs $1.17
Cleveland-Liberty Co. 1.26
Tomball 1.40

SINCLAIR-PRAIRIE OIL MARKETING CO.

Texas Panhandle—(May 23, '41)—Same as Humble except Sinclair-Prairie begins with Below 25 at $0.83.

West Texas & New Mexico—(May 30, '41)—Same as Humble except Sinclair-Prairie begins with Below 25 at $0.80.

Texas Gulf Coast—(May 21, '41)—Same as Humble.

Mexia District, Texas—(May 30, '41)—Same as Humble, East Central Texas, except Sinclair-Prairie also posts Below 25 at $0.95.

East Texas—(May 21, '41) $1.25

Long Lake, Texas—(May 21, '41) $1.23

Chapel Hill (Washington Co.) Tex.:
Below 50 grav. (Jan 20, '42) $1.18
50 grav. & above (Feb. 2, '42) $1.25

STANOLIND OIL PURCHASING CO.

(May 21, '41)

Clinton, Tex.—Same as Humble Tex. Gulf Coast except Stanolind begins with Below 21 at $1.08.

Fairbanks, N. Houston & Rosslyn, Tex.—Same as Humble Dickinson schedule.

Lake Creek, Tex.—(Apr. 9, '42)—Same as Humble Tex. Gulf Coast except Stanolind begins with Below 21 at $1.08.

E. Texas $1.25
Satsuma & Tomball, Tex $1.40

STANOLIND OIL & GAS CO.

(May 21, '41)

W. Beaumont & Spindletop (Jefferson Co., Tex.) **& Highland Island** (Galveston Co., Tex.)—Same as Humble Tex. Gulf Coast.

Hendrick & Henderson (Winkler Co., Tex.)—Same as Humble West Texas except Stanolind begins with Below 26 at $0.82.

Jay Welder (Calhoun Co., Tex.)—Nov. 14, '41—Same as Humble Anahuac.

Spencer & Pyote (Ward Co., Tex.)—June 8, '42—Same as Humble W. Texas.

Magnolia Sealey South (Ward Co., Tex.)—June 8, '42—Same as Humble W. Texas except Stanolind ends with 36 & above at $1.04.

THE TEXAS CO.

(May 21 '41)

Panhandle, Tex.—Same as Humble except Texaco begins with 34-34.9 at $1.03.

W. Texas & Lea Co., N. M.—Same as Humble except Texaco posts $0.78 for 23.9 & below and ends with 36 & above at $1.04.

Texas Gulf Coast—Same as Humble except Texaco ends with 34 & above at $1.36.

Duval, Mirando, Tex.—Same as Humble Mirando except Texaco ends with 28-28.9 at $1.21.

Refugio, Tex.—Same as Humble except Texaco ends with 28-28.9 at $1.26.

East Texas $1.25
Darst Creek, Tex. $1.14
Conroe, Tex. $1.43
Hockley & Cochran Cos., Tex ..... .87

SHELL OIL CO., INC.

(May 20, '41)

West Texas & Lea Co., N. M.—Same as Humble except Shell ends with 36 & above at $1.04.

Fisher Co., Tex.—(Dec. 11, '41)—Same as Humble W. Central Texas except Shell begins with Below 25 at $0.89.

East Texas $1.25
Livingston field, Polk Co., Tex. $1.25
Pecos Co., Texas, (except Yates Shallow Pool) ..... .95
Pecos Co., Tex., Yates Shallow Pool ..... .82
Mercy field, San Jacinto Co., Tex. (Feb. 27, '42) 1.25

CONTINENTAL OIL CO.

Carson & Hutchinson Cos., Tex.—(July 9, '41)—Same as Humble Panhandle except Continental begins with Below 29 at $0.91.

Mirando, Tex.—(July 1, '41—Same as Humble.

Wade City & Clara Driscoll, Tex.—(July 1, '41)—Same as Humble Refugio.

Alfred & Magnolia City, Tex.—(May 21, '41), $1.35

Eddy Co., N.M.—(May 30, '41)—Same as Humble N. M. schedule except Continental begins with Below 29 at $0.88.

PAN AMERICAN PRODUCTION CO.

(May 21, '41)

Hastings & S. Houston, Tex.—Same as Humble Tex. Gulf Coast except Pan Am. begins with Below 21 at $1.08.

Gillock, Tex.—Same as Humble Dickinson except Pan Am. begins with Below 21 at $0.95.

East Texas $1.25
Cayuga, Tex. ..... .90
Goodrich, Tex. (Dec. 1, '41) 1.20

CRUDE OIL PRICES

Prices in $ per bbl. of 42 U. S. gals. at the well. A. P. I. gravity. Prices ar effective as of 7 a. m. of dates shown.

CALIFORNIA

Posted by S. O. California, May 23, 1941

(All gravities above those quoted take highest price offered in that field)

Gravity	Signal Hill (Long Beach)	Wilmington	El Segundo	Seal Beach	Huntington Beach	Inglewood	Olinda Brea Canon	Athens-Rosecrans	Torrance	Richfield	Whittier East Coyote (La Habra)	Montebello	West Coyote Hills	Santa Fe Springs	Greeley, Canal, Wasco	Colen Levee	Mountain View	Elk Hills, Buena Vista Hills Midway-Sunset, Lakeview Area	Lost Hills	Coalinga	Gravity
14-14.9	....	$0.68	....	....	$0.71	....	$0.70	....	$0.70	$0.70	$0.70	$0.72	....	....	....	....	....	$0.73	$0.73	$0.73	14-14.9
15-15.9	....	.71	....	....	.75	$0.76	.72	....	.72	.71	.72	.72	....	....	....	....	....	.73	.73	.73	15-15.9
16-16.9	....	.74	$0.79	....	.79	.79	.75	....	.74	.73	.75	.72	....	....	....	....	....	.73	.75	.73	16-16.9
17-17.9	....	.78	.82	....	.82	.82	.78	....	.77	.76	.78	.72	....	....	....	....	....	.75	.78	.73	17-17.9
18-18.9	$0.80	.82	.86	....	.86	.85	.81	....	.80	.79	.82	.74	....	....	....	....	....	.78	.81	.73	18-18.9
19-19.9	.84	.86	.90	....	.89	.88	.85	....	.83	.82	.85	.77	....	....	....	....	$0.73	.81	.84	.75	19-19.9
20-20.9	.88	.90	.94	....	.93	.92	.88	....	.86	.85	.89	.80	....	....	....	....	.76	.85	.87	.77	20-20.9
21-21.9	.92	.94	.98	....	.96	.95	.91	....	.89	.89	.92	.84	....	....	....	....	.79	.90	.90	.80	21-21.9
22-22.9	.96	.98	1.02	$0.88	.99	.98	.95	....	.93	.93	.96	.87	....	....	....	....	.83	.94	.93	.83	22-22.9
23-23.9	1.00	1.02	1.05	.92	1.02	1.01	.98	....	.97	.98	1.00	.91	....	....	....	....	.87	.99	.96	.86	23-23.9
24-24.9	1.03	1.06	1.07	.97	1.05	1.04	1.01	....	1.01	1.02	1.03	.94	$0.99	....	....	....	.90	1.03	.99	.89	24-24.9
25-25.9	1.07	1.09	1.10	1.01	1.08	1.07	1.04	....	1.05	1.06	1.07	.98	1.02	....	....	....	.94	1.07	1.01	.92	25-25.9
26-26.9	1.11	1.12	1.12	1.06	1.11	1.10	1.08	....	1.09	1.10	1.11	1.01	1.06	....	....	....	.97	1.11	1.04	.95	26-26.9
27-27.9	1.15	1.15	1.15	1.10	1.14	1.14	1.11	....	1.13	....	1.15	1.05	1.10	$1.04	....	....	1.01	1.15	1.07	.98	27-27.9
28-28.9	1.18	1.18	1.17	1.15	1.17	1.17	1.14	....	1.17	....	....	1.08	1.13	1.08	....	....	1.04	1.19	1.10	1.00	28-28.9
29-29.9	1.20	1.21	....	1.19	1.20	1.20	....	$1.17	....	....	....	1.12	1.17	1.12	....	....	1.07	1.24	1.13	1.02	29-29.9
30-30.9	1.23	1.24	....	....	1.23	1.22	....	1.21	....	Elwood	....	1.15	1.21	1.15	$1.01	$1.09	1.10	1.28	1.16	1.04	30-30.9
31-31.9	....	....	....	....	....	1.24	....	1.25	....	Terrace	....	1.19	1.24	1.19	1.04	1.12	1.14	....	....	1.06	31-31.9
32-32.9	....	....	....	....	....	....	....	1.29	....	F.o.b. Ship	....	1.23	1.28	1.23	1.07	1.14	1.17	....	....	1.09	32-32.9
33-33.9	....	....	....	....	....	....	....	1.32	....	$1.22	....	1.27	....	1.26	1.10	1.17	....	....	....	1.11	33-33.9
34-34.9	Kettleman Hills		....	....	....	....	....	1.36	....	1.25	....	1.31	....	1.30	1.13	1.20	....	....	....	1.13	34-34.9
35-35.9	....	$1.23	....	....	....	....	....	....	....	1.28	....	1.35	....	....	1.16	1.22	....	....	....	....	35-35.9
36-36.9	....	1.26	....	....	....	....	....	....	....	....	....	1.39	....	....	1.19	1.25	....	....	....	....	36-36.9
37-37.9	....	1.29	....	....	....	....	....	....	....	....	....	1.43	....	....	1.22	....	....	....	....	....	37-37.9
38-38.9	....	....	....	....	....	....	....	....	....	....	....	1.47	....	....	1.25	....	....	....	....	....	38-38.9
39-39.9	....	....	....	....	....	....	....	....	....	....	....	1.51	....	....	....	....	....	....	....	....	39-39.9
40-40.9	....	....	....	....	....	....	....	....	....	....	....	1.53	....	....	....	....	....	....	....	....	40-40.9

Playa Del Rey: (FOB Standard Pipe Line) 20-20.9, $0.80; 21-21.9, $0.84; 22-22.9, $0.87.
Wheeler Ridge: 22-22.9, $0.76; 23-23.9, $0.80; 24-24.9, $0.83
Newhall, Kern River, Kern Front, McKittrick & Round Mountain: 14-14.9, $0.73.

LOUISIANA-ARKANSAS

Posted by S. O. Louisiana, May 22, '41

Gravity	Atlanta, Ark. et al.	De Soto, La. et al.	Rodessa, La. et al.	Bunkie, La. et al.	Darrow, La. et al.	University, La.* (Baton Rouge) Shallow Production
40 & Above	$1.08	$1.18	$1.20	$1.30	$1.30	$1.48
39-39.9	1.06	1.16	1.18	1.28	1.28	1.46
38-38.9	1.04	1.14	1.16	1.26	1.26	1.44
37-37.9	1.02	1.12	1.14	1.24	1.24	1.42
36-36.9	1.00	1.10	1.12	1.22	1.22	1.40
35-35.9	.98	1.08	1.10	1.20	1.20	1.38
34-34.9	.96	1.06	1.08	1.18	1.18	1.36
33-33.9	.94	1.04	1.06	1.16	1.16	1.34
32-32.9	.92	1.02	1.04	1.14	1.14	1.32
31-31.9	.90	1.00	1.02	1.12	1.12	1.30
30-30.9	.88	.98	1.00	1.10	1.10	1.28
29-29.9	.86	.96	.98	1.08	1.08	1.26
28-28.9	.84	.94	.96	1.06	1.06	1.24
27-27.9	.82	.92	.94	1.04	1.04	1.22
26-26.9	.80	.90	.92	1.02	1.02	1.20
25-25.9	.78	.88	.90	1.00	1.00	1.18
Below 25	....	.86	.88	.98	....	....
24-24.9	.76	....	.88	....	.98	1.16
23-23.9	.74	....	.86	....	.96	1.14
22-22.9	.72	....	.84	....	.94	1.12
21-21.9	.70	....	.82	....	.92	1.10
Below 21	.68	....	.80	....	.90	....
20-20.9	....	....	....	....	....	1.08
Below 20	....	....	....	....	....	1.06

*Posted July 2, '42.

Atlanta schedule includes Buckner, Lewisville, Magnolia, Village & Schuler (Jones Sand), Ark.

De Soto schedule includes Sabine, Fouke, Homer, Miller co., Nebo & Sugar Creek.

Rodessa schedule includes Cotton Valley & Shreveport (Cross Lake) ending with Below 25 at $0.88; Anse La Butte (Aug. 1, '41); Caddo (Oct. 15, 1941).

Bunkie schedule includes Eola, Olla, South Olla, Pine Prairie (May 21, '42), and University (Baton Rouge) Deep Production (May 22, '42).

Darrow schedule includes Bayou Mallet, Choctaw, Jeanerette, Lirette, N. & S. Crowley, Port Allen, Port Barre, Potash, Roanoke, & St. Martinville.

Big Creek, Dorcheat, McKamie, Distillates (Sour) $1.15
Heavy Smackover Crude ..... .83
Cotton Valley Distillate (Sept. 1, '41) 1.40
Cotton Valley (Holloway Sand Crude) 1.25
Lisbon Distillate 1.20

(Continued next column)

LOUISIANA-ARKANSAS *(Cont'd)*

Posted by Shell Oil Co., Inc. (May 20, '41)

Gravity	Iowa	Roanoke	Gibson
Below 20	$0.99	$0.94	$0.89
20-20.9	1.01	.96	.91
21-21.9	1.03	.98	.93
22-22.9	1.05	1.00	.95
23-23.9	1.07	1.02	.97
24-24.9	1.09	1.04	.99
25-25.9	1.11	1.06	1.01
26-26.9	1.13	1.08	1.03
27-27.9	1.15	1.10	1.05
28-28.9	1.17	1.12	1.07
29-29.9	1.19	1.14	1.09
30-30.9	1.21	1.16	1.11
31-31.9	1.23	1.18	1.13
32-32.9	1.25	1.20	1.15
33-33.9	1.27	1.22	1.17
34 & above	1.29	1.24	1.19

Iowa schedule includes Black Bayou & White Castle La. fields.

Roanoke schedule includes Chalkley, La. field.

Gibson schedule includes S. Houma, Hester & W. Lake Verret, La. fields.

Happytown field, St. Martin Par., La. $1.15

Posted by Arkansas Fuel Oil Corp.

Urania, La. (May 22, '41) $1.15

Posted by Continental Oil Co. (May 21, '41)

Tepetate, La. $1.18
Ville Platte, La. 1.20
Lake Arthur, La. 1.18
Ritchie, La. (Sept. 1, '41) 1.08

Abbeville, La.

Below 36 $1.07	37-37.9 ... $1.11	39-39.9 ... $1.15
36-36.9 ... 1.09	38-38.9 ... 1.13	40 & above 1.17

CANADIAN FIELDS

Posted by Imperial Oil Limited

Western Ontario (Nov. 6, 1939)

Petrolia ..... $2.10 Oil Springs $2.17

Turner Valley Crude Oil (July 16, '41)

(Prices FOB producer's tankage)

33-33.9 ... $1.35	44-44.9 ... $1.57	55-55.9 ... $1.79
34-34.9 ... 1.37	45-45.9 ... 1.59	56-56.9 ... 1.81
35-35.9 ... 1.39	46-46.9 ... 1.61	57-57.9 ... 1.83
36-36.9 ... 1.41	47-47.9 ... 1.63	58-58.9 ... 1.85
37-37.9 ... 1.43	48-48.9 ... 1.65	59-59.9 ... 1.87
38-38.9 ... 1.45	49-49.9 ... 1.67	60-60.9 ... 1.89
39-39.9 ... 1.47	50-50.9 ... 1.69	61-61.9 ... 1.91
40-40.9 ... 1.49	51-51.9 ... 1.71	62-62.9 ... 1.93
41-41.9 ... 1.51	52-52.9 ... 1.73	63-63.9 ... 1.95
42-42.9 ... 1.53	53-53.9 ... 1.75	64 & over 1.97
43-43.9 ... 1.55	54-54.9 ... 1.77	

Absorption Gasoline (July 16, '41)

90% Rec., 20 lb. Reid v. p. $2.28
90% Rec., 17 lb. Reid v. p. 2.44

ROCKY MOUNTAIN FIELDS

Posted by Stanolind Oil & Gas Co. (May 20, '41)

Salt Creek (except Tensleep crude), Midway & Dutton Creek, Wyo.

Below 29 $0.96	32-32.9 ... $1.04	36-36.9 ... $1.12	
29-29.9 ... .98	33-33.9 ... 1.06	37-37.9 ... 1.14	
30-30.9 ... 1.00	34-34.9 ... 1.08	38-38.9 ... 1.16	
31-31.9 ... 1.02	35-35.9 ... 1.10	39-39.9 ... 1.18	
		40 & above 1.20	

Wyoming:		**Wyoming:**	
Tensleep Crude	$0.6785	Grass Creek Light	$1.00
Frannie Light	.70	Grass Creek Heavy	.50
Frannie Heavy	.47	Elk Basin	1.00
Hamilton Dome	.45	Iles, Colo.	1.07

Posted by Ohio Oil Co. (May 20, '41)

Elk Basin, Wyo. $1.00
Grass Creek Wyo., Light 1.00
Rock Creek, Wyo. 1.15
Lance Creek, Wyo., (July 1, '41) 1.12

Posted by Continental Oil Co. (May 21, '41)

Ft. Collins & Wellington, Col.

Below 29 $0.96	32-32.9 ... $1.04	36-36.9 ... $1.12	
29-29.9 ... .98	33-33.9 ... 1.06	37-37.9 ... 1.14	
30-30.9 ... 1.00	34-34.9 ... 1.08	38-38.9 ... 1.16	
31-31.9 ... 1.02	35-35.9 ... 1.10	39-39.9 ... 1.18	
		40 & above 1.20	

Canon City & Florence, Col $1.05	Big Muddy, Wyo., (May 30, '41) ... $1.08
Cat Creek, Mont. .. 1.15	Lance Creek, Wyo., (July 1, '41) 1.12

Posted by Independent Pipe Line Co. (Aug. 1, '41)

Falls City, Neb., field price $0.90
Falls City, Neb., loaded in tank cars 0.95
Shubert, Neb., loaded in tank cars 0.97

SOUTHEASTERN FIELDS

Posted by Allied Pipe Line Corp.

Tinsley (Miss.) Crude (Oct. 16, '41)

24-24.9 ...	$0.745	32-32.9 ...	$0.905
25-25.9 ...	.765	33-33.9 ...	.925
26-26.9 ...	.785	34-34.9 ...	.945
27-27.9 ...	.805	35-35.9 ...	.965
28-28.9 ...	.825	36-36.9 ...	.985
29-29.9 ...	.845	37-37.9 ...	1.005
30-30.9 ...	.865	38-38.9 ...	1.025
31-31.9 ...	.885	39-39.9 ...	1.045
		40 & above ...	1.065

Pickens (Miss.) Crude (Dec. 16, '41)

24-24.9 ...	$0.685	32-32.9 ...	$0.845
25-25.9 ...	.705	33-33.9 ...	.865
26-26.9 ...	.725	34-34.9 ...	.885
27-27.9 ...	.745	35-35.9 ...	.905
28-28.9 ...	.765	36-36.9 ...	.925
29-29.9 ...	.785	37-37.9 ...	.945
30-30.9 ...	.805	38-38.9 ...	.965
31-31.9 ...	.825	39-39.9 ...	.985
		40 & above ...	1.005

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FOR SALE: Three Model 70-C Wayne Computer Pumps. Painted all red, with 11 ft. hoses. In original crates, ready for shipment. $198.00 each. One Weaver Hydraulic Hoist, $75. Schermerhorn Oil Company, La-Salle, Illinois.

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PERSONALS

Alan M. Scaife

Alan Magee Scaife, member of Gulf Oil Corp.'s board of directors and of the finance committee, has been elected to vice-presidency. Mr. Scaife was formerly chairman of the board of the Pittsburgh Coal Co. He became a member of Gulf's board in August 1941.

* * *

Pana Refining Co.'s annual golf party at Pana, Ill., was attended by a number of Chicago oil men. Among them were: **William Franke,** American Mexican Petroleum Co.; **John Carson,** Hughes Oil Co.; **Fred Falley** and **Carl Sass,** Falley Petroleum Co.; **George Davies** and **Holger Jensen,** Jensen Petroleum Co.; **Henry Plane** and **Mel Hill,** Johnson Oil Co.; **George N. Olson,** George N. Olson Co.; **Jerry LePine,** Trans-American Petroleum Co.; and **George D. Williams,** Williams Petroleum Co.

* * *

Wilson Henry, Chicago, Valvoline Oil Co., announces that the Wisconsin Petroleum Assn. will send a six-man golf team to challenge the Chicago Oil Men's Club team at its fall outing. The Chicago team won in 1941; Wisconsin's in 1939 and 1940. Mr. Henry is chairman of the golf committee of the Chicago Oil Men's Club.

* * *

William P. Anderson, vice-president of Douglas Oil & Refining Co., has resigned to devote his full time to the Comet Oil Co. Ltd. of which he is president.

* * *

A party of British American Oil Co. officials have been touring Western Canada investigating the wartime petroleum situation in that area. In the group were **W. K. Whiteford,** vice president and former director of company's U. S. production; **Dr. F. A. Gaby,** vice-president; **H. C. Arnold,** Tulsa, Okla., in charge of U. S. production; **Henry Rae,** Tulsa, company's exploration geologist in the U. S.; and **J. H. Turnpenny,** advertising manager.

* * *

O. D. Robinson, Jr., son of Republic Oil Co.'s president, has joined the Coast Guard as a seaman, second class, and is now on active duty.

* * *

Lieut. (j. g.) G. S. Maxson (formerly in Shell's Washington office) is now in the Navy's purchases and awards section.

Fisherman's Tall Story Club Has New Prospect

NPN News Bureau

WASHINGTON — Fishery Co-ordinator Ickes (better known in oil circles as the Petroleum Co-ordinator) now has a very legitimate right to knock off work at any time, sling a rod over his shoulder and slap this sign on his office door

"Off to co-ordinate fish. Back later to co-ordinate oil."

Back in 1941 B.R. (before rationing), Pure Oil Dealer **L. R. Still,** Atlanta, Ga., had a sign reading "Itching for Business" atop his scratching post. Now, "Still Itching for Gasoline" has taken its place as Dealer Still looks forward to the time when gasoline will be more plentiful in the East Coast area

Harry Erdman, former pilot of one of Republic Oil Co.'s oil field planes, is now ferrying bombers across the ocean, a recent announcement of that company states.

* * *

New department for plant protection of Humble's Baytown refinery is in charge of **J. Ellis Clegg,** according to Superintendent **Gordon L. Farned.** Mr. Clegg was formerly in charge of the New Orleans district for the Federal Bureau of Investigation. **J. D. Hunnicutt,** chief of guards for the refinery and docks, and **D. T. Cheshire,** chief of guards for the Baytown ordnance works, will continue in their present capacities and will report directly to Mr. Clegg.

* * *

N. E. Schneider, Amarillo, sales manager for Danube Oil Corp., had a narrow escape from death while in Dallas recently when his car was practically demolished in a traffic accident. As it was, he suffered lacerations around the head and throat when his head was jammed through the windshield, and assorted bruises while he was "rattling around in that car like a pea in a box". He didn't lose a day from his desk, however.

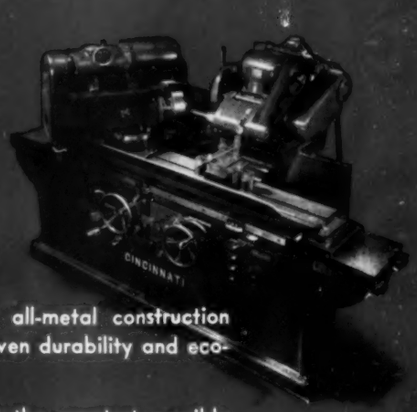
* * *

R. J. Daugherty, superintendent of public relations department of Cities Service and mayor of Bartlesville, has received a bronze plaque citing the city's winning the all-Oklahoma traffic safety award for cities of its size. Credit for the city's standing goes to its traffic safety council, of which **Lew B. Roberts,** Cities Service personnel director, has been chairman for the past two years. Oklahoma has won the 1941 grand award in the National Traffic Safety Contest.

* * *

Truman Branton, Housh & Thompson production superintendent, left here Friday for Miami Beach, Fla., training station, after being commissioned a first lieutenant in Army Air Force. Lieut. Branton's assignment was not announced. He left Gulf to become H. & T. production chief five years ago and was stationed first at Talco, later in Houston. He is 36, married, and has a daughter, Judy Lynn.

MASTER SPEEDRANGER



This variable speed drive combines all the advantages of an all-metal construction resulting in extreme compactness, infinitely variable speed, proven durability and economical operation.

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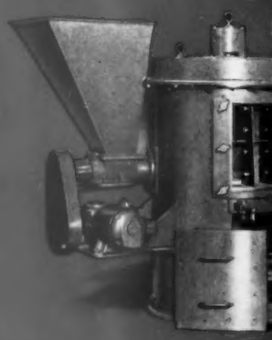

INFINITELY VARIABLE SPEED. The output speed may be increased or decreased instantly, at the turn of the hand wheel, to any R.P.M. within the range of the unit. This change in speed can be made at any time, while the unit is at rest or in motion.

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HORSEPOWER. Now available in sizes up to and including 3 horsepower.

SPEED RANGES. Three different ranges—3 to 1, 6 to 1 and 9 to 1 are available.

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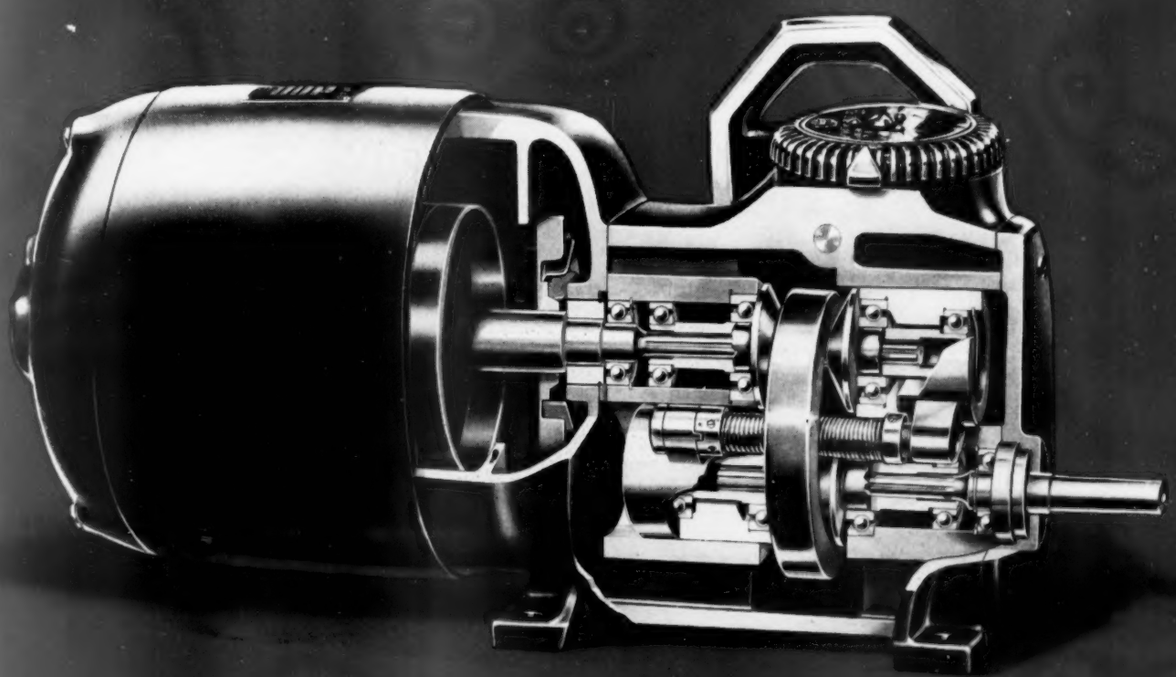

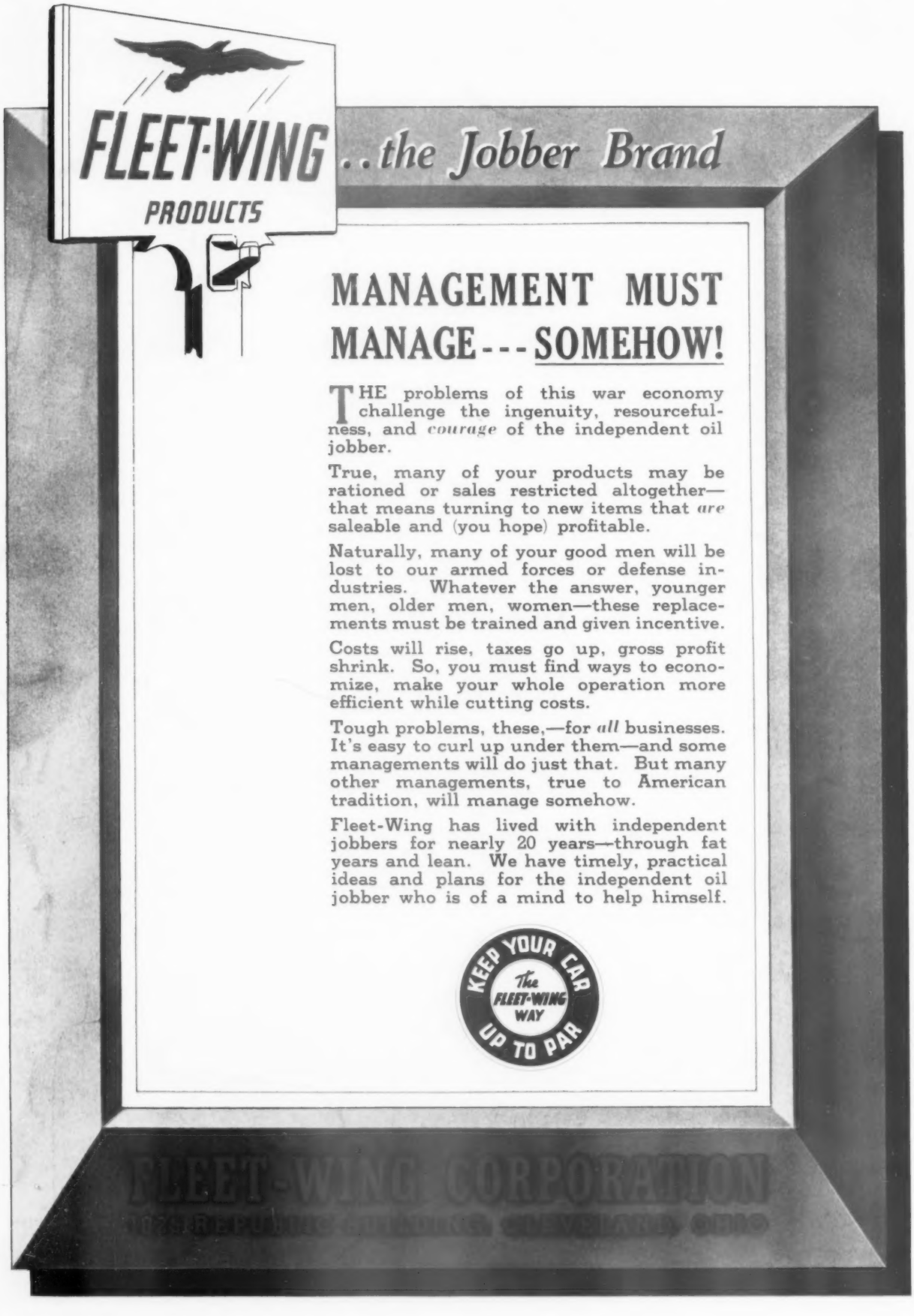
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TECHNOLOGY Dept

NATIONAL PETROLEUM NEWS

Monthly Technical Section Devoted to
REFINERY MANAGEMENT and PETROLEUM CHEMICAL TECHNOLOGY

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DETROIT

Volume 34 | July 29, 1942 | Number 30

How Oil Refiners Are Overcoming War's Handicaps

Meet Metal Shortages With New Refinery Design

1—War-time steel making practices call for cutting down volume requirements for structures, using substitutes for former standard grades of steels and designing shells and housings so parts can be replaced more frequently....R-199

2—Practical applications in the oil industry of the new National Emergency alternate steels are being studied R-200

3—Suggestions for designing and constructing plants to eliminate the bottleneck of "scarce" materials are given by the War Production Board.....R-202

4 New Ideas to Wartime Efficiency

1—Enameled cast iron bubble caps, used at eastern refinery, give longer life and make for easier cleaning than unsurfaced metal R-205

2—Metal reclaimed from junk yards builds a new war-time "lube oil" plant for Oklahoma refiner.....R-204

3—Foam directory compiled by Massachusetts plants provides additional foam supplies in event of major oil plant fires R-207

4—"Midget refinery" takes crude from line, converts it into fuel for engines at pipeline pumping stations....R-206

Reduce Power Shortage With Expanding Refinery Gas Turbines

By Goldsbury and Henderson . . . Turbines of the "elastic fluid" type have been installed at refineries to derive power from expansion of process gases. Chief problems arise from corrosive components of the gas.....R-211

What War Requires of Lubes in Air Service

By C. M. Larson . . . Severe requirements imposed on lubricating oils in aircraft in war service are discussed, as compared with conditions in air line service, advantages of lubricants processed from Pennsylvania grade crude are presented R-223

Influence of Sulfur Compounds On Lead Needs for War Aero Fuel

By Julian G. Ryan . . . A method is provided for refiners to calculate from analyses of sulphur content the tetraethyl lead requirements of aviation gasoline stocks and of blends of different sulfur-containing stocks of similar hydrocarbon composition R-234

War Orders on Refinery Supplies

Checklist of government orders affecting refiners' supplies, materials R-243

America's Men of Refinery Technology Rise to World's Crisis

THE greatest developments in the history of petroleum science, and perhaps the greatest in all scientific history, are taking place today. These are the developments of the refinery men of the United States and its Allies in meeting the crucial demands of civilization for articles of war with which to preserve itself—articles of war that today can only be made in vast quantity and in efficient quality from petroleum.

For these absolute necessities of war—aviation gasoline, new lubricants for airplanes and tanks, toluol for explosives, and rubber—America's oil scientists, America's oil engineers, oil chemists and every man at every refinery and in every refinery construction organization, are reaching far into their minds, are using inspired ingenuity for new ideas, new methods, new designs, new equipment and new operations.

And at the same time these men are carrying out these ideas with new construction that within the next 12 months will easily pass one billion dollars, and by the end of a second year will probably way exceed two billion dollars. Never before in history has there been such tremendous plant development in so short a time and all on NEW IDEAS that come from the very latest in science.

The rise of oil technologists to civilization's demand has sent them into the fields of general chemistry. No longer does the oil industry just skim gasoline, kerosine, lubes and fuel oil from the crude as nature prepared it. Today oil scientists are duplicating nature in her processes of millions of years ago, and going nature one better. From nature's product the scientists of oil are isolating innumerable kinds of molecules and atoms and are re-assembling them in new forms for the greater advancement of our living and for the better prosecution of the war.

To help these swiftly moving men of oil technology, NATIONAL PETROLEUM NEWS, with this issue, introduces its technical material in a form and of a character more adaptable to the needs of these men of oil science, a form and character that we hope will be of greater help to them. The editorial content will treat of what these men are doing, a reporting of their part in this war, a reporting of what they are doing on the fighting line of science.

Also, in recognition of the great adventure of these men of oil technology into the field of chemical technology, NATIONAL PETROLEUM NEWS adds that phrase to its mast-head—"Chemical Technology"—as one of its objectives on behalf of its technical readers.

This section is only a start, and we hope you like it. Your advice and suggestions for its improvement are heartily asked and will be sincerely welcomed. For such as this new editorial treatment of the problems of the industry is, we have to thank our many friends among refinery and equipment men and our friends at Washington who are directing and co-ordinating this greatest of all oil industry scientific effort—the winning of the war with new ideas, new methods and new products of our petroleum.

Warren C. Platt

Editor and Publisher

Honorary Lecturer before A.S.T.M. on Gasoline

Dr. Graham Edgar Dr. G. E. F. Lundell

● **Dr. Graham Edgar, vice-president and director of research, Ethyl Gasoline Corp., (left) with Dr. G. E. F. Lundell, retiring president of the American Society for Testing Materials, at the annual meeting of the Society in June in Atlantic City. Dr. Edgar delivered the Marburg lecture, feature of annual meetings commemorating the first secretary of the Society, purpose of which is to have leaders in research review developments in important fields. Dr. Edgar described the progress of the petroleum industry in bringing the American public its superior motor fuels and discussed briefly what motor fuels might be after the war.** **(See pg. R-222)**

Born in the south, Dr. Edgar attended the State University of Kentucky, and received his doctor's degree at Yale. He taught science in University of Virginia and California Institute of Technology and spent a brief time with the National Research Council in Washington. When Ethyl Gasoline Corp. was formed he became director of research and was made vice-president in 1932.

REFINERY MANAGEMENT *and* PETROLEUM CHEMICAL TECHNOLOGY

July 29, 1942
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Number 30

A MONTHLY TECHNICAL SECTION OF NATIONAL PETROLEUM NEWS *incorporating International Petroleum Technology*

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War Emergency Steel-Making Changes Refinery Design

EVEN without the impetus of the recent "suggestion" from the Petroleum Co-ordinator's Office at Washington, it is apparent that the heavy war demand for steel, together with shortages in chromium and other alloying elements and materials, will greatly affect the engineering of the plants to be built in the war refinery expansion program.

"Engineers designing plants for which a project application will be made should take into consideration the vital and scarce nature of these materials and in every instance should eliminate their use if it is at all possible to do so, finding substitutes therefor," said the statement, coming from the Bureau of Industrial Conservation of the War Production Board, through Deputy Petroleum Co-ordinator Ralph K. Davies. "Where total elimination is not possible, the quantity should be reduced as much as possible."

Buildings and other structures should be designed to use as little structural or other steel as practiable, the government authorities point out. "Structural steel may be used only when it is necessary to support or carry heavy equipment, craneways, etc.," it is stated. "Loading racks should be designed with wooden structures or walkways. Bear in mind the use of steel alone is not fireproof construction."

The industry must become reconciled to a less permanent type of structure even though parts of it have to be replaced at frequent intervals, says this statement, which emanates from the authority that denies applications for priority ratings on materials, where it is the judgment of their engineers either that substitutes for critical materials or a lesser quantity of available steels could be used.

Plan Frequent Replacements

Where a chromium steel is necessary, the Office of Petroleum Co-ordinator calls on refiners to plan on frequent replacements, if by so doing they are able to reduce the percentage of chromium; unless such replacements would call for extraordinary expense such as, for example, tearing down boiler settings or in other ways greatly increasing plant downtime.

"Frequently 1.5% chromium steel will give two years service in equipment usually designed with 4 to 6% chromium," it is pointed out. (See following page for text of this statement from the OPC).

Thus, refinery design engineers, in addition to drawing up plans which eliminate skirting and platforms as much as possible, substitute other materials for structural steel here, will be called upon to use their ingenuity to design furnaces, heat exchangers and other equipment so that tubes and supports can be replaced with less work and in less time.

The steel manufacturers, now concentrating on the manufacture of a small number of standard grades of low alloy steels, in place of the large number of highly alloyed grades formerly produced, to say nothing of special steels they have made previously, may find it more efficient practice to supply these new steels in different shapes and sizes than in the past. This may influence plant design. In any event, the refinery designer, accustomed in the past to order material to his own sizes and specifications will in many instances find that deliveries from the mills are expedited where he specifies the standard shapes and sizes in greatest production.

Grades Limited

Where steels of above 2% chromium have to be used to meet corrosion conditions, the steel authorities have suggested that standard specifications be set up for a limited number of grades and that refiners order from these standard grades for their individual needs. This in place of setting up their own individual standards for the composition of these alloy steels, as some companies have done in the past. Such a program would aid the steel companies in expediting deliveries from their mills, they state, since in many cases the individual order from the refining company is a relatively small amount for the mill to turn out and production schedules are delayed in filling such orders.

The suggestion that specifications for cracking coil tubes could be reduced to 6 in number and still cover most refiners' needs for corrosion resisting material has already been made by Max B. Miller, head of the Equipment Procurement Section of the Refining Division of the OPC. Back in March, he stated that one manufacturer had received orders from refiners calling for tubes of 19 different standards of composition. Mr. Miller suggested that specifications be reduced to the following 6 for the war emergency period, for both carbon and chromium alloy tubes:

1—Low carbon steel.

2—Low carbon steel with 0.5% molybdenum.

3—2-3% chromium steel with 0.5% molybdenum.

4—4-6% chromium steel with 0.5% molybdenum.

5—7-9% chromium steel with 0.5% molybdenum.

6—18% chromium, 8% nickel stainless steel.

Some of the tube manufacturers have since said that such a simplification would assist their production greatly and refiners have said these specifications would include all their needs.

Specifications for 3 grades of chromium-nickel steels, based on temperature requirements, were announced by the War Production Board July 2. They cover parts for, and equipment in, petroleum refineries and synthetic rubber plants, among other industries. These specifications are:

For operating temperatures between 900 deg. F. and 1400 deg. F., not over 6% chromium, no nickel.

For operating temperatures between 1400 and 1600 deg. F., 18% maximum chromium content, 8% maximum nickel.

For operating temperatures above 1600 deg. F., 25% maximum chromium, and 12% nickel.

For all uses, in operations at temperatures below 900 deg. F., carbon steel is to be specified. Users are told in the WPB order, when setting up their specifications, to give no higher temperature requirements than are necessary to maintain operations as currently proposed.

Alloy Shortage Growing

The scarcity of alloys in the face of growing war demands was recognized by the steel manufacturers early in 1941. It started with nickel, and the following months have seen shortages develop in many other alloying elements, particularly chromium. Fortunately, in this emergency, metallurgical art and science in steel making has advanced to the point

where the specific effect of each alloying element is known. It has been discovered that, in correct and balanced combinations, each element intensifies the action of the others, thus making it do double duty.

Replace 100 Steels

Hence, it has been possible for the steel manufacturers to design new complex, low alloy steels, through careful co-operation between the leading metallurgists and representatives of producers and fabricators. This new series of 16 grades, known as the NE (National Emergency) alternate steels, is to replace the list of approximately 100 standard alloy steels issued last January by the American Iron and Steel Institute and the Society of Automotive Engineers. The War Production Board requires that the NE steels be used, wherever practicable, in place of the higher alloy steels.

Some of the present steel restrictions are recognized as necessary wartime measures. However, statements from steel authorities accompanying the issuing of the NE standards bring out that the shortages of alloy materials can be expected to continue indefinitely. They say also that a new technique of steel making is coming out of the war emergency which indicates that some of the standard alloy steels of the past will never be generally used again. Recognizing that performance data is as yet lacking, the steel companies are urging all their large consumers to study the new steels, apply them wherever practicable in place of higher alloy materials, and report the results.

732-1

Application of the Substitute NE Steels In Oil Industry Is Being Studied

Some practical applications in the oil industry have already been listed for the new NE (National Emergency) alternate steels in substitution for the nickel, chromium and chromium-nickel alloy steels, the use of which is now carefully allocated by the War Production Board because of the critical shortages of the alloying elements.

The NE standards of composition were drawn up by a committee of leading metallurgists, upon the request of the former government agency, Office of Production Management, to the American Iron and Steel Institute.

The use of the NE steels by oil companies has been suggested in the official report introducing the new steels, for certain drilling and producing equipment, also for limited refinery applications, such as low temperature pressure vessels (dewaxing equipment) and for small parts for high temperature service.

However, since the maximum chromium content in the NE steels is 0.60%, to take advantage of what alloy is found in scrap metal, refinery engineers are proceeding cautiously in suggesting the use of these steels in cracking coil tubes, oil transfer lines, heat exchangers, return bends, valves and so on, where substantial resistance to corrosion is required.

Chromium Reduced to 1.5%

Until recently, a 4-6% chromium steel was used by refiners for moderate corrosion conditions and 18-20% for severe conditions. It was generally considered that steels with below 2% did not contain sufficient chromium to materially improve their corrosion resistance over the ordinary mild steels, and consequently the lower cost mild steels were used. This was before the war emergency necessitated building plants for shorter life than in the past.

The recent suggestion of the War Production Board, issued through the Office of Petroleum Co-ordinator, is that 1.5% chromium steel may be found to give two years service in equipment usually designed with 4-6% chromium. One refiner in the Mid-West has used cracking coil tubes with 1.25% chromium for handling gas oil and Illinois crude, where corrosion conditions are not severe. These tubes have been in service for over a year.

Another refiner suggested that, if the creep strength of the NE steels were high enough, they might be used for tube supports, bolts, flanges and other parts where high temperatures are encountered but the parts are not in contact with the corrosive oil or gas. Chromium alloy is now being used in such instances because of its increased strength.

Use Alloy Steels Where Needed

That the NE alternate steels were not intended to replace the alloy steels wherever their use is necessary is stated in the report of the metallurgists who drew up the standards, which says:

"The alternate steels do not embrace the stainless steels or irons such as the high chromium or chromium-nickel types; medium chromium (2 to 10% chromium) steels which sometimes contain other elements and which are used to resist scaling at elevated temperatures; or any class of tool steel."

The metallurgist of one steel company commented as follows, along the same line:

"It is understood that, where materials have a complex function to perform; that is, one involving high temperature with possible corrosive reaction and alternate stress caused by heating and cooling, all operated under a given set of physical requirements, that the proper choice of a material must be based upon engineering data and well established experience."

Balanced Analyses

The present 16 grades of NE steels (see Table 1) are the result of careful design by the steel makers giving balanced analyses comprising various combinations of carbon, manganese and molybdenum with and without 0.40-0.60% of chromium and nickel.

They are divided into the following three groups of possible alternates for something like 100 grades of A.I.S.E. (American Iron and Steel Institute) and S.A.E. (Society of Automotive Industries) standards which were issued last January by the two organizations:

(1) Standard Carburizing grades; (2) Semi-thorough hardening grades of the .30% carbon steel; (3) Thorough hardening steels of .35% carbon and higher.

Group 1 includes NE 8024 and NE 8124, both manganese-molybdenum steels, and NE 8724 and NE 8817 grades, which are chromium-nickel-molybdenum steels. This group has been promulgated by the War Production Board as possible alternates for the manufacture of oil well drilling cutters, and reamers and anti-friction bearings, and shafts and general purpose pins and shafts.

Group 2 includes NE 8233, a manganese-molybdenum alloy steel; NE 8630, a nickel-chromium and molybdenum steel; and the standard available steel A-4037, a carbon-molybdenum grade which falls within the maximum limit for alloys. These are suggested as alternates for the currently used standard grades of semi-through hardening steels containing both water hardening and oil hardening steels. They are generally used in tensile strength ranges of from 100 000 to 150,000 psi. and in Brinell hardness ranges of 200 to 300. Some are also used in the normalized or normalized and tempered condition with tensile strength values of 65,000 to 105,000 psi. In addition to armament purposes these NE steels are promulgated for use in automotive, aircraft and tank parts.

Group 3 (thorough hardening steels) includes the NE 8245 to NE 8547 manganese-molybdenum series; the NE 8600 to NE 8900 nickel-chromium-molybdenum

Table 1—New NE (National Emergency) Steel Specifications

(Announced by the Iron and Steel Branch of the War Production Board as possible alternates for Nickel, Chromium and Chromium-Nickel constructional alloy steels)

Des.	Carbon	Mang.	Moly.	Nickel	Chromium
NE 8024	0.22/0.28	1.00/1.30	0.10/0.20	.....	.....
NE 8124	0.22/0.28	1.30/1.60	0.25/0.35	.....	.....
NE 8233	0.30/0.36	1.30/1.60	0.10/0.20	.....	.....
NE 8245	0.42/0.49	1.30/1.60	0.10/0.20	.....	.....
NE 8339	0.35/0.42	1.30/1.60	0.20/0.30	.....	.....
NE 8442	0.38/0.45	1.30/1.60	0.20/0.40	.....	.....
NE 8447	0.43/0.50	1.30/1.60	0.20/0.40	.....	.....
NE 8547	0.43/0.50	1.30/1.60	0.40/0.60	.....	.....
NE 8620	0.18/0.23	0.70/0.95	0.15/0.25	0.40/0.60	0.40/0.60
NE 8630	0.27/0.33	0.70/0.95	0.15/0.25	0.40/0.60	0.40/0.60
NE 8724	0.22/0.28	0.70/0.95	0.20/0.30	0.40/0.60	0.40/0.60
NE 8739	0.35/0.42	0.75/1.00	0.20/0.30	0.40/0.60	0.40/0.60
NE 8744	0.40/0.47	0.75/1.00	0.20/0.30	0.40/0.60	0.40/0.60
NE 8749	0.45/0.52	0.75/1.00	0.20/0.30	0.40/0.60	0.40/0.60
NE 8817	0.15/0.20	0.70/0.95	0.20/0.40	0.40/0.60	0.40/0.60
NE 8949	0.45/0.52	1.00/1.30	0.30/0.40	0.40/0.60	0.40/0.60

NOTE. The following additional element specifications apply to all the basic open hearth steel shown above: Phosphorus 0.040% max.; Sulfur 0.040% max.; Silicon 0.20/0.35%.

series and the standard available A 4000 carbon molybdenum series.

The steels in this group are suggested as alternates for the 2300 standard series steels (3.50% nickel) in oil refinery equipment for low temperature pressure vessels (dewaxing equipment) for pine valves and fittings, for retorts and shafts in prime movers, for aircraft engine parts and in the machine tool industry.

They are also suggested as alternates for the 3100 series standard steels (1.25% nickel, 0.75% chromium) and the 4100 series (chromium-molybdenum) in the oil industry for bolts, couplings, side bars in draw works parts, shafting, drill collars, jars, kelly bars, reamer bodies, slush rods, pumps and tool joints, bolts, couplings and pull rods. Also for the 4300 series (nickel-chromium-molybdenum) and for the 6100 series (chromium-vanadium) for high temperature bolts for petroleum refineries and special parts for pressure vessels. (Table 2 gives the compositions of the 2300 standard series steels, the 3100, 4100, 4300 and 6100 series, which it is suggested the NE steels in this group may replace.)

Report on Alloys

In addition to many production and manufacturing problems and in addition to the general effect of alloys in steels (now known by the steel industry with precision) the following comment on the war time emergency situation on alloys was made in the report submitting the NE standards.

"Manganese. As a means of conserving low-carbon ferromanganese a limit of 1.00% manganese was set for steels in which the carbon content does not exceed 0.25%.

"For steels in which the carbon content exceeds 0.25%, a limit of 1.65% manganese was set.

"Silicon. Because of the reported uncertainty of a continuous supply of ferrosilicon containing a consistent percentage of silicon, and the steel industry's limited experience in the use of steels containing a relatively high percentage of silicon, the committee has adhered to the general practice of specifying a silicon content of about 0.20 to 0.35% except in the case of the 9200 series.

"Nickel. Small quantities of nickel are recoverable from recurrent alloy steel scrap turnover. By combining the incidental or recoverable nickel from scrap with small quantities of pure nickel or of other elements, a saving in the overall use of such elements will be made. Therefore a maximum nickel content of 0.60% is recommended for alternate steels.

"Chromium. Because of the possibilities of conservation inherent in the use of small quantities of several alloying elements as stated above, a maximum chromum content of 0.60% is recommended for alternate steels.

"Molybdenum. A maximum of 0.60% is recommended except for steels which must have special creep characteristics."

* * *

Suggests Available Steels For Refinery Service

Steels which are readily available in the present emergency, involving none or very little nickel or any other critical alloy, and which can be procured in plates, bars or tubes, are suggested for refinery service by A. Grodner, process equipment department, Blaw-Knox Division of Blaw-Knox Co., Pittsburgh. Mr. Grodner stated:

"From minus 20 deg. F. to 650 deg. F., the American Society of Mechanical Engineers' Code allows the full working strength of the regular flange and firebox quality steel, as per the A.S.T.M. Specification A-70. This is the least expensive material and the easiest material for the steel mills to roll today, since it involves no alloys whatever of either chromium or nickel. Above a metal temperature of 650 deg. F., the strength of these steels declines because of their creep values, so that at 800 deg. metal temperature, the working stress permitted for the plate drops to 18% of the ultimate tensile strength (from 25% at 650 deg. F.). For most of the processes, therefore, this material can probably be satisfactorily used, with perhaps an additional allowance in thickness for the lower permissible working stress at the higher temperatures.

"For temperatures lower than minus 20 deg. F., and down to about minus 50 deg. F., we have found that the same carbon steel mentioned in the previous paragraph is still satisfactory, provided it is given a special normalizing treatment prior to its fabrication into pressure vessels. When the temperature must go below minus 50 deg. F. and down to minus 100 deg. F., a low nickel steel, A.S.T.M. Specification A-203, containing 2.00 to 2.75 nickel is quite satisfactory. Not until you go to temperatures lower than minus 100 deg. F. is it necessary to go to 18-8 chrome nickel stainless steel.

"For temperatures above 650 deg. F., we would also suggest a carbon molybdenum group of steel, designated as A.S.T.M. A-204. These steels not only have greater tensile strength at temperatures up to 650 deg. F., but they retain their strength over a wider elevated temperature range because of their higher creep values. Their full strength is permitted up to and including 750 deg. F.

Table 2—Compositions of the 2300, 3100, 4100, 4300 and 6100 Standard Steels

As Issued Jointly Jan. 1, 1942 by the American Iron & Steel Institute and the Society of Automotive Engineers

(These, among other steels, are to be replaced by the new NE steels wherever practicable)

1942 AISI Number	1942 SAE Number	Carbon	Mang.	Phos. Max.	Sulfur Max.	Silicon	Nickel	Chromium	Molybdenum
A 2317	2317	0.15-0.20	0.40-0.60	0.040	0.040	0.20-0.35	3.25-3.75	.....	.....
A 2330	2330	0.28-0.33	0.60-0.80	0.040	0.040	0.20-0.35	3.25-3.75	.....	.....
A 2335	.....	0.33-0.38	0.60-0.80	0.040	0.040	0.20-0.35	3.25-3.75	.....	.....
A 2340	2340	0.38-0.43	0.70-0.90	0.040	0.040	0.20-0.35	3.25-3.75	.....	.....
A 2345	2345	0.43-0.48	0.70-0.90	0.040	0.040	0.20-0.35	3.25-3.75	.....	.....
A 3115	3115	0.13-0.18	0.40-0.60	0.040	0.040	0.20-0.35	1.10-1.40	0.55-0.75	.....
A 3120	3120	0.17-0.22	0.60-0.80	0.040	0.040	0.20-0.35	1.10-1.40	0.55-0.75	.....
A 3130	3130	0.28-0.33	0.60-0.80	0.040	0.040	0.20-0.35	1.10-1.40	0.55-0.75	.....
A 3135	3135	0.33-0.38	0.60-0.80	0.040	0.040	0.20-0.35	1.10-1.40	0.55-0.75	.....
A 3140	3140	0.38-0.43	0.70-0.90	0.040	0.040	0.20-0.35	1.10-1.40	0.55-0.75	.....
A 3141	3141	0.38-0.43	0.70-0.90	0.040	0.040	0.20-0.35	1.10-1.40	0.70-0.80	.....
A 3145	3145	0.43-0.48	0.70-0.90	0.040	0.040	0.20-0.35	1.10-1.40	0.70-0.90	.....
A 3150	3150	0.48-0.53	0.70-0.90	0.040	0.040	0.20-0.35	1.10-1.40	0.70-0.90	.....
A 4119	4119	0.17-0.22	0.70-0.90	0.040	0.040	0.20-0.35	.....	0.40-0.60	0.20-0.30
A 4130	.....	0.17-0.22	0.70-0.90	0.040	0.040	0.20-0.35	.....	0.80-0.60	0.20-0.30
A 4125	4125	0.23-0.28	0.70-0.90	0.040	0.040	0.20-0.35	.....	0.40-0.60	0.10-0.30
A 4130	4130	0.28-0.33	0.40-0.60	0.040	0.040	0.20-0.35	.....	0.80-1.10	0.15-0.25
E 4132	.....	0.30-0.35	0.40-0.60	0.040	0.040	0.20-0.35	.....	0.80-1.10	0.18-0.25
A 4134	.....	0.32-0.37	0.40-0.60	0.040	0.040	0.20-0.35	.....	.....	0.15-0.25
E 4135	.....	0.33-0.38	0.70-0.90	0.025	0.025	0.20-0.35	.....	.....	0.18-0.25
A 4137	4137	0.35-0.40	0.70-0.90	0.040	0.040	0.20-0.35	.....	.....	0.15-0.25
E 4137	.....	0.35-0.40	0.70-0.90	0.025	0.025	0.20-0.35	.....	.....	0.18-0.25
A 4140	4140	0.38-0.43	0.75-1.00	0.040	0.040	0.20-0.35	.....	.....	0.15-0.25
A 4142	.....	0.40-0.45	0.75-1.00	0.040	0.040	0.20-0.35	.....	.....	0.15-0.25
A 4143	.....	0.40-0.45	0.75-1.00	0.040	0.040	0.20-0.35	.....	.....	0.30-0.40
A 4145	4145	0.43-0.48	0.75-1.00	0.040	0.040	0.20-0.35	.....	.....	0.15-0.25
A 4150	4150	0.48-0.53	0.75-1.00	0.040	0.040	0.20-0.35	.....	.....	0.15-0.25
E 4150	.....	0.48-0.53	0.70-0.90	0.025	0.025	0.20-0.35	.....	.....	0.20-0.27
A 4317	.....	0.15-0.20	0.45-0.65	0.040	0.040	0.20-0.35	1.65-2.00	0.40-0.60	0.20-0.30
A 4320	4320	0.17-0.22	0.45-0.65	0.040	0.040	0.20-0.35	1.65-2.00	0.40-0.60	0.20-0.30
A 4337	.....	0.35-0.40	0.60-0.80	0.040	0.040	0.20-0.35	1.65-2.00	0.60-0.80	0.30-0.40
E 4337	.....	0.35-0.40	0.60-0.80	0.025	0.025	0.20-0.35	1.65-2.00	0.70-0.90	0.23-0.30
A 4340	4340	0.38-0.43	0.60-0.80	0.040	0.040	0.20-0.35	1.65-2.00	0.70-0.90	0.20-0.30
E 4342	.....	0.40-0.45	0.60-0.80	0.025	0.025	0.20-0.35	1.65-2.00	0.70-0.90	0.23-0.30
									Vanadium
A 6120	.....	0.17-0.22	0.70-0.90	0.040	0.040	0.20-0.35	.....	0.70-0.90	0.10 min.
A 6145	.....	0.43-0.48	0.70-0.90	0.040	0.040	0.20-0.35	.....	0.80-1.10	0.15 min.
SAE 6150	.....	0.48-0.45	0.65-0.90	0.040	0.040	0.20-0.35	.....	0.80-1.10	0.15 min.
E 6151	.....	0.47-0.53	0.70-0.90	0.025	0.025	0.20-0.35	.....	0.80-1.10	0.15 min.
A 6152	.....	0.48-0.55	0.70-0.90	0.040	0.040	0.20-0.35	.....	0.80-1.10	0.10 min.

and at a metal temperature of 900 deg. F. their strength is reduced to approximately 2/3 of that at 750 deg. F. At 950 deg. F. their work stress is 53% and at 1000 deg. F. it is 33% of the values at 759 deg. F."

* * *

Properties of NE Steels Described by Metallurgist

Properties of the NE 8600 to 8900 steels, the chromium-nickel-molybdenum series, which have been suggested for limited applications in petroleum refineries, are described as follows by Harry W. McQuaid, of Republic Steel Corp., in a recent bulletin of the American Society for Metals:

By Harry W. McQuaid

This group (NE 8600 to 8900) is especially designed to provide the maximum hardenability and best combination of properties with the minimum of any one of the alloying elements. The alloys which contribute to the depth of hardening—in the order of their effectiveness—are carbon, manganese, molybdenum, chromium, silicon and nickel. Fine grain size also has its usual effect. Hardenability can be varied to meet the requirements of thin and thick sections by varying first the manganese and silicon and also the carbon and molybdenum.

Each alloying element in a specification contributes in some way to the over-all properties of the heat treated part. Thus, nickel is of value in strengthening the iron base (ferrite) by solid solution, and it improves the general ductility, especially in sections where complete quenching is difficult to obtain. Chromium is an important hardening alloy and contributes to abrasion resistance, especially in carburized or high carbon steel. Molybdenum is important as a hardening element and increases the time available for handling in quenching. It also contributes to stability of the hardened structures when high skin temperature is developed by friction, and this makes it desirable in gear and bearing steels.

By combining in one analysis the superimposed effects of smaller percentages of all the above elements, we achieve a uniformity in properties almost impossible to obtain in any other way. This is because it is difficult to produce, in tonnage by the usual scrap and pig process, any simpler alloy steel without the other elements occurring as residuals to a varying degree. These residuals are very detrimental, since they cause a variation in hardenability from that expected in the specified composition, and therefore cause a non-uniform product. Residual elements constitute an increasingly difficult problem as alloy scrap, segregated by composition, builds up and cannot be used in many much-wanted analyses. Thus the National Emergency chromium-nickel-molybdenum combinations permit a much broader use of scrap and will simplify the steel maker's problem of residuals.

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WPB Demands Plants Be Designed To Save Scarce Materials

Engineers designing oil industry construction projects of all kinds have been urged by the Office of Petroleum Co-ordinator to make greater efforts to eliminate entirely all scarce materials, or to design to use lesser quantities of them. In a release quoting statements from the Bureau of Industrial Conservation of the War Production Board, Deputy Petroleum Co-ordinator Ralph K. Davies urged oil companies to:

1—Familiarize themselves with the list of scarce materials, and in designing plants, find substitutes therefor or, where total elimination is not possible, reduce the quantity as much as possible.

2—Where it is necessary to use scarce alloys, plan for frequent replacement so that the proportion of alloy in such equipment can be reduced.

3—Design buildings and other structures to use as little structural steel as possible; plan for less permanent type of structures, even though parts have to be replaced frequently.

4—Make every effort to find used tanks, compressors and tubular goods, among other equipment, before ordering new equipment.

Text of the release, issued June 19, is as follows:

THE War Production Board has declared that the following materials, most of which are used at times by the petroleum industry, are scarce materials, vitally needed for war purposes and in general are termed critical: aluminum, asbestos, cadmium, calcium-silicon, chromium, cobalt, cork, copper and copper alloys, lead, magnesium, plastics, nickel, rhodium, steel and iron of all types, and their alloys, tin, tin plate and terneplate, tungsten and tungsten carbides, vanadium, zinc and zinc coated metals, cotton duck, manila fiber and cordage, jute, burlap, Kraft paper, lead, manganese, mercury, sisal, and rubber of all types, new and reclaimed.

Engineers designing plants for which a project application will be made should take into consideration the vital and scarce nature of these materials and in every instance should eliminate their use if it is at all possible to do so, finding substitutes therefor, and where total elimination is not possible, reduce the quantity as much as possible.

The materials branches of the War Production Board are denying the use of certain classes of materials and equipment as follows:

1. Galvanized iron and steel pipe, except where the properties of the water demand zinc coating.

2. Steel water tanks (except closed pressure types).

3. Both black and galvanized corrugated iron and sheet for side walls and roofs for buildings.

4. 85% magnesia pipe covering for insulation purposes except where temperature exceeds 212°.

5. Metal base plumbing fixtures.

6. The use of cork for insulation except where extremely low temperatures are required.

7. Valves and fittings which are trimmed with chromium, stainless steel, bronze, brass, or nickel except to meet special processing requirements. Valves over 2" with brass bodies are usually prohibited.

8. Steel sash, windows and frames, steel bucks, steel doors and frames, steel roof decking, metal roofing, except where extreme fire hazards exist.

9. New steel storage tanks to be used for fuel oil, crude oil, and other heavy oils whenever it is practicable to construct concrete storage tanks.

10. Cast iron soil pipe, or sewage pipe except those of standard weight and then only those portions required within a building.

11. Ferrous metal for water mains where the use of asbestos cement, concrete or wood pipe is practicable.

12. Water well screens made of brass, copper and other non-ferrous alloys. Gravel packed screens or screens of other types will serve the purpose for a reasonable length of time.

13. Steel wire fence of the chain link type.

14. Ferrous metal culverts.

15. Electric conduit (metal) where wiring can be safely installed without it.

16. Stand-by equipment. Spare parts to be held to a bare minimum.

Construction equipment of all kinds and oil well drilling equipment must not be included in a project application since such equipment does not become a permanent part of the finished project.

Machine tools, rubber products, chemicals, business machines, office furniture, office supplies, automobiles, trucks, and tires should not be included in project applications; there are special orders governing the rating or distribution of these materials.

Aluminum, and steel plate are on allo-

cation and are being allocated only to those projects which are extremely important in the war program. Projects should be designed so far as possible to minimize or eliminate their use. Every effort should be made to keep steel plates under 3/16", where steel plates *must* be used.

Criticals Listed

The most critical materials are aluminum, stainless steel, chromium steel, nickel, tin and copper. It is probable that items of material requiring these alloys will be denied by the War Production Board unless accompanying information is provided with the project application explaining why these alloys must be used, why no substitute can be used, and a further statement to the effect that the percentage of critical metals in the alloys has been reduced to a practical working minimum.

The petroleum industry's refining projects require a great deal of chromium steel. The War Production Board is insisting that projects be designed with the least amount of chromium or other alloy metals possible. The War Production Board suggests that where scarce alloys are necessary, we plan on frequent replacements, if by so doing, we are able to reduce the amount of such scarce materials, unless such replacements would cause extraordinary expense, such as tearing down boiler settings, etc. Frequently 1.5% chromium steel will give two years service, in equipment which is usually designed with 4-to-6% chromium. Every pound of chromium steel which the petroleum industry uses must be taken from a ship or a shell, and consequently, every pound of chromium steel is precious. All steel plate is being allocated and only those projects which are the most important in the war program are receiving it. The ship-building program is behind schedule because of the shortage of steel plate; therefore, projects should be so designed as to minimize to the greatest extent possible the use of steel plates and sheets.

Steel storage tanks require plate for the large sizes and sheet for the small sizes. Before requesting new tankage, every effort should be made to find available second-hand tanks which can be cut down, moved, and re-erected at the desired location.

All large compressors are now on strict allocation and are not available except for the most vital projects. Wherever compressors, pumps, electric generators or motors are required, every effort should be made to find second-hand equipment which will do the work. They are all scarce and critical.

Where tubular goods are required use second-hand materials whenever possible. Salvage unused lines and if possible lines which are not operating to capacity. Whenever new pipe is required, a size should be chosen only sufficiently large to carry the amount of fluid which must be handled, and the weight of the pipe should be consistent with the pressure under which it must operate. Use the smallest and lightest pipe possible. Do not allow for greater capacity or greater pressure which might be required at some later date. Seamless pipe and tubing are not available except where required in processing equipment subject to high temperatures and high pressures. When possible, specify welded pipe in your application.

Buildings and other structures should be designed to use as little structural or other steel as practicable. Structural steel may be used only when it is necessary to support or carry heavy equipment, craneways, etc. Loading racks should be designed with wooden structures and walkways. Bear in mind that the use of steel alone is not fireproof construction.

Affects WPB Decisions

It is the practice of the War Production Board to assign preference ratings sufficiently high to insure the procurement of materials only when it can be shown that the materials are to be used in a project necessary in the prosecution of the war. In very few instances is the War Production Board authorizing an increase in rating simply because material cannot be procured on the rating which has been assigned.

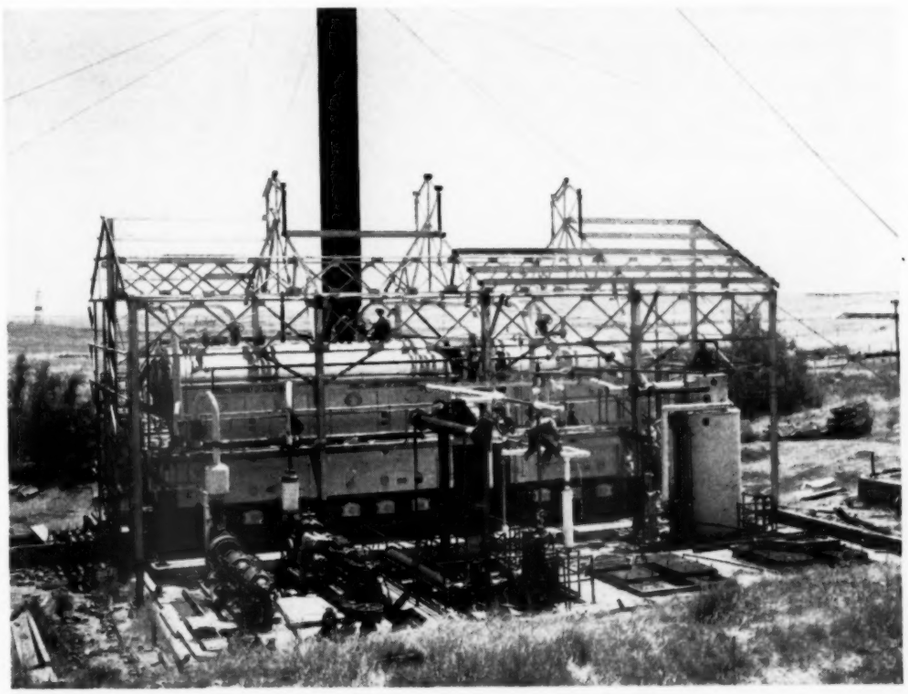
In making an application for a preference rating for a project as prescribed on Form PD-200 and PD-200a, the instructions should be followed implicitly and completely and each item of material and the value thereof listed in accordance with the form. When a number of items are lumped together with one value and it becomes necessary to deny or delete certain items, it is then necessary to write to the applicant for the prices of the items denied so that the value of all rated materials may be shown correctly. This delay can be avoided if the applicant adheres strictly to Form PD-200 and PD-200a.

Must Cut Criticals Use

In the designing of projects for which a preference rating is to be applied, engineers should become reconciled to the fact that we are engaged in an all out war requiring scarce materials far in excess of our available supply. Many engineers are designing for long life and with high factors of safety just as they designed before we entered the war, when these scarce materials were abundant. Every feature of design should be studied with the thought in mind of reducing or eliminating the amount of scarce materials to the greatest extent possible. We must become reconciled to a less permanent type of structure even though we may have to replace parts of it at frequent intervals. The War Production Board recognizes that temporary or cheap construction and the absence of stand-by facilities creates certain hazards, but it believes that industry must assume its share of the hazards along with the Army and the Navy.

Coming Down—To Make Scrap for the Steel Mills

This water plant of Shell Oil Co. Inc. in California once played an important part in the lives of hundreds of men and women in an oil field camp. Now it is being dismantled to serve in another field of usefulness. This company's collection campaign to June 1 had netted 3178 tons of scrap material



Metal Reclaimed from Junk Piles Built a War 'Lube' Oil Plant

ENOUGH high-pressure air and ammonia compressors, heat exchangers, evaporators and process equipment have been made from junk and second-hand material by Mid-Continent Petroleum Corp. to solve the bottleneck of securing plant equipment for its war expansion program. The company has constructed, out of such material, the greater portion of a lubricating oil plant to supply war needs.

Under the direction of E. M. Dons, Mid-Continent's chief engineer, starting in the spring of 1941, 8 company engineers surveyed every important salvage yard within 1000 miles of Mid-Continent's West Tulsa refinery, covering Missouri, Illinois, Texas, Louisiana, Arkansas, Kansas, Indiana and Oklahoma.

Where possible sources of usable materials were located by telephone, personal inspections were made, and old metal bought that could be reclaimed and used in the company's expansion program. In many cases the material cost the company more than new, but the necessity for getting work under way and starting early production of critical and essential war petroleum products dictated the program rather than economy.

New compressors are listed by War Production Board as "very critical". Mid-Continent's engineering and mechanical staff, under guidance of F. B. Koontz, vice-president in charge of manufacturing, and Chief Engineer Dons, converted obsolete, low-pressure gas compressors into high-pressure air units by purchasing second-hand high-pressure cylinders, revamping them and making them fit.

Compressors Redesigned

Low pressure gas compressors also were redesigned into two-stage ammonia compressors—a more difficult problem. This was accomplished by obtaining second-hand high-pressure cylinders and revamping them to fit the ammonia compressor operating conditions.

In conversion it was necessary to install new stuffing boxes with vented glands. The distance between the steam cylinder and the compression cylinder was insufficient to install the new type stuffing box, so it was necessary to increase this distance a total of 24 ins. The old compressor rod was in one piece.

For the new operating conditions it was necessary to redesign and split the rod into two pieces, connecting them by a specially-designed coupling. Another compressor, of the Freon type, also was revamped and converted into an ammonia compressor to be driven with V-belts and powered by a second-hand Troy engine.

'Junk' Makes Heat Exchangers

A total of 34 heat exchangers and condensers, containing thousands of square feet of heat-transfer surface and representing tons of weight, were fabricated. More than 50% of the material needed was taken from reclaimed junk.

Many tons of second-hand steel plate, bars and rings, were refabricated into evaporators. Bars of steel 5.5 by 5.5 ins. were cut into strips, welded together, and forged into rings up to 84 in. in diameter, machined and drilled to make flange rings.

Plant protection of vital units against possible sabotage necessitated building fences and water lines. Use of 200 tons of junk eliminated demand on the steel industry for new cast iron bell and spigot pipe as well as fence material.

Old towers and stills, weighing over 500 tons, were salvaged and made into 31 reflux drums. Second-hand steel plate was fabricated into 11 service tanks and 11 fractionator towers, the latter complete with trays. All of this was done in the refinery shops.

Junk Plate Reclaimed

Tons of second-hand plate taken from purchased junk and old refinery equipment were reclaimed, sand blasted, polished and shipped to eastern factories where they were refabricated into process equipment. The factories, in many cases, would have been unable to secure material from the steel mills to make the equipment which the company had ordered.

Since April 1, 1941, Mid-Continent Petroleum Corp. has reclaimed enough old iron from junk piles to release iron for the equivalent of 391,432 hand grenades and 24,615 field mines, if measured in terms of these particular weapons for our armies, the company officials have figured out.

In addition, Mid-Continent has shipped 1800 tons of scrap iron and steel to steel mills as part of its contribution to the metal scrap collection program. This was material which could not be reclaimed.

Mr. Koontz, who has charge of the company's 40,000-bbl. refinery in West Tulsa, is very proud of the record of his company and attributes much of the success of the program to the assistance given by the staff of Wright W. Gary, Washington, director of the Refining Division, Office of Petroleum Co-ordinator—Robert B. Cragin, assistant director; Phillip M. Robinson, assistant director; Douglas P. Bailey, chief of operations section; Max B. Miller, chief of equipment procurement section; Bruce K. Brown, assistant deputy co-ordinator; also the assistance of William F. Huff, formerly director of materials and now assigned to serve in a special capacity to represent the Petroleum Co-ordinator.

Gary Praises Company's Work

Mr. Koontz is very proud of a letter from Mr. Gary which reads:

"We have observed with a great deal of interest and satisfaction the manner in which you have been able to erect your lubricating oil plant at Tulsa through the use of second-hand equipment and materials.

"The further we proceed in connection with the erection of all war plants in the petroleum refineries, the more the necessity of utilizing existing and second-hand equipment becomes apparent. Since you have erected the greater portion of your plant through the accumulation of junk and second-hand material of this kind, eliminating demand especially on the steel industry where that material can be used direct in the very essential war program, we wish to congratulate you

F. B. Koontz, vice-president in charge of manufacturing, Mid-Continent Petroleum Corp.

E. M. Dons, chief engineer, Mid-Continent Petroleum Corp., who directs the company's program for reclaiming refinery equipment from old material bought in junk yards

and the manufacturing department of your corporation in this connection.

"You may be interested in knowing that the industry as a whole is co-operating in this connection and it is my thought that this kind of management will permit the industry to complete its various installations on schedule."

Junk Becomes 'Sunday Clothes'

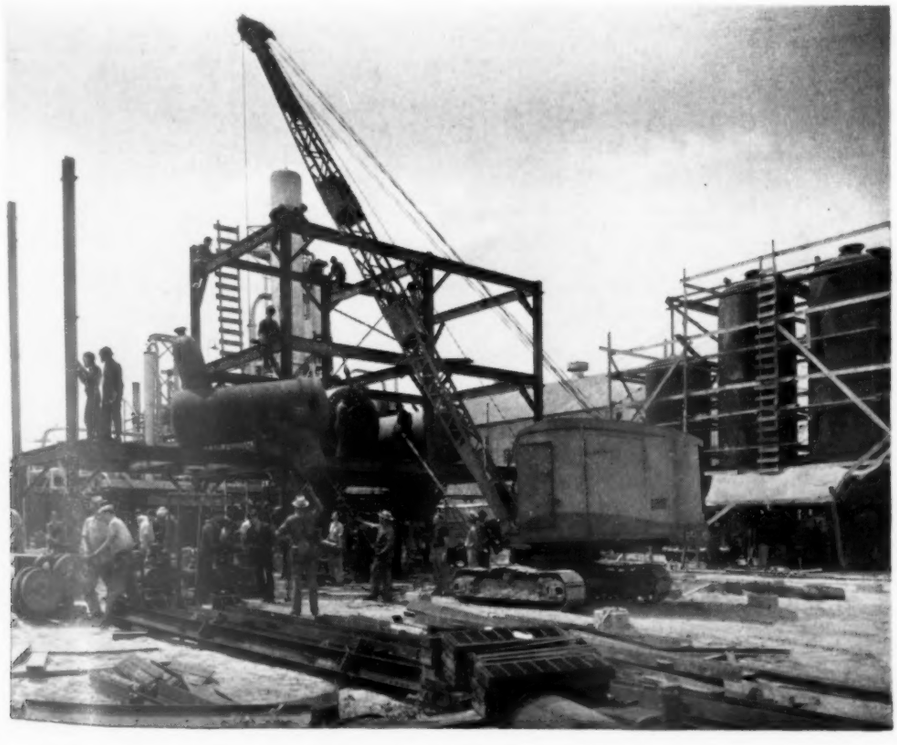
The Mid-Continent Petroleum Corp. says of its reclamation program:

"Materials formerly considered as non-usable for new, efficient processes and/or maintenance, in reality, today are the "Sunday clothes" of the refiner; not only for continuity of operation, but, particularly, to be utilized in the construction of new processes for the production of critical petroleum war products; especially those processes that pertain to the manufacture of aviation lubricating oils. The choice of using new or old material is no longer dictated by economy, but by necessity and patriotic duty."

The company's motto in this work appears to be "It can be done, it is being done, and will continue to be done—from junk".

•

Hoisting water separators, made from reclaimed metal, into place in the Mid-Continent Petroleum Corp. refinery. Heat exchangers on far left have been made from reclaimed metal also, as well as the separators at extreme right. Much of the structural steel in the foreground was picked up in salvage yards or reclaimed while dismantling obsolete equipment



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Enameled Bubble Caps Have Longer Life, Clean Easier Than Unsurfaced Metal

Enameled cast iron bubble caps are being successfully used in refinery fractionating towers by Standard Oil Co. of Ohio, in place of unsurfaced iron caps. Not only do the enameled caps give much longer life, thereby saving material needed in the war effort, but they are also more easily cleaned, the company states.

Sohio has been using enameled cast iron bubble caps to meet mildly corrosive conditions at temperatures up to 700 deg. F. All installations in cracking coil fractionator tower service and in some crude stills where mild corrosive conditions exist are now being made with enameled cast iron caps, crabs and risers.

Long Life Claimed

Standard cast iron caps, protected by a baked enamel coating, have an estimated service life of from 6 to 8 times the life of the unprotected cap, while cost of the enameled cap is approximately double that of the unprotected one. Only reasonable care need be exercised in handling the enameled caps to avoid chipping.

For several years, Sohio had been using cast iron bubble caps and risers in fractionating towers. Some caps had to be replaced after only 6 months service in certain areas, the worst being at the vapor inlet section of the primary towers of cracking coil units. In many cases, it was not advisable to continue the cap in service another 6 months—even though it was not entirely corroded through—because the metal was so thin that handling would cause considerable breakage.

Trial Installation Made

Initial installation of enameled standard 6 in. diameter cast iron bubble caps was made at the vapor inlet tray section of two primary towers of the 1000-lb. cracking coil units at Sohio's Latonia refinery (Latonia Refining Corp., Covington, Ky.) in May, 1940. Temperature at this particular location is approximately 700 deg. F. After 6 months' service, the caps appeared to be in excellent condition.

After two years these caps were again inspected, the findings indicating that some chipped places occur which are the result of bumping the caps together in removing for cleaning. Some deterioration is apparent at these points, but since they are quite small, it will take perhaps another year or two before holes will be eroded or corroded entirely through the metal. It is on this basis that the estimated life of 6 to 8 times that of unprotected cast iron caps is made.

Easier to Clean

Experience has also proven that the enameled caps remain much cleaner and are easier to clean at the end of each 6-month period, apparently because of the smooth surface which does not permit the coke deposit to adhere as readily as does the usual rough cast iron surface. This, of course, reduces labor expense in cleaning. No change in tower operating procedure has been necessary because of the enameled caps.

Subsequently, a number of enameled risers and crabs as well as bubble caps have been installed, both at Latonia and Sohio's No. 1 refinery at Cleveland. There are now approximately 1200 enameled caps in service. It has not been necessary thus far to make any replacements.

Tests Show Durability

Doubt was felt at first, both by Sohio engineers and the enameling company, that the enameled caps at an operating temperature of about 700 deg. F. would stand the thermal shock of contact with 300 deg. F. steam when the tower is taken off stream and rapidly cooled to permit cleaning. Experience has removed this doubt. Tests under more rigorous conditions have not been made.

Use of enameled cast iron in cold acid service has not been investigated on plant scale, but test strips in cold streams of hydrochloric acid are said to have stood up "fairly well" under laboratory observation.

Experimental bubble caps made of

porcelain-enamel on 10-12 gauge pressed carbon-steel plate have been used to replace 4 to 6% chrome alloy caps which had a service life of 2 to 2½ years. The temperatures were at or under 250 deg. F. with both hydrochloric acid and sulfur the corrosive agents. The porcelain-enameled caps did not last for more than 1 year because the thin support was liable to excessive bending during handling and cleaning, causing chipping off of relatively large areas of the enamel which resulted in cap failure by corrosion. However, Sohio engineers point out, the enamel itself was not attacked by either of the corrosive agents, and if the trays were re-designed to permit use of a heavier-gauge porcelain enameled cap, it is believed this corrosion problem will be solved. At present, light gauge 11 to 13% chrome alloy caps are being used, some of which have been in service for 5 years and were still in "fairly good" condition at the last inspection.

Bubble caps made entirely from ceramic material would be impractical for commercial use, engineers say, pointing out that its relatively poor resistance to mechanical shock as well as poor resistance to thermal shock would make for extensive replacement and resultant economic loss.

* * *

615.5
734.1

'Midget' Refinery Processes Crude from Pipelines Into Fuel for Pumping Station Engines

A method and apparatus for taking crude oil from the pipeline and processing it on the spot, in a "midget refinery", into fuel for the internal-combustion engines at pipeline pumping stations has been patented by Continental Oil Co.

Fuels may be made for internal combustion engines using gas, gasoline or diesel fuel, and thus save the cost of transporting the fuel from refineries to isolated pumping stations. It is also shown to be possible to mount the unit for use in portable service.

In essence, the apparatus (See Fig. 1) consists of a still utilizing exhaust heat from the prime mover to distill off the lighter hydrocarbons, such as the gasoline fraction, and a second still heated by burning some of the crude being pumped, for distilling off heavier fractions, such as various grades of diesel fuel; together with suitable heat exchangers, scrubbers and condensers for recovery and purification of desired fractions. Equipment is so arranged that unwanted fractions may be returned to the pipeline. The patent explains:

Patent Explains Usefulness

"In long pipe lines for transporting oil across country, it is necessary to construct pump staations in isolated localities. This makes it difficult to secure fuel at reasonable costs. In the case of an oil pipe line, a portion of this oil can be used as fuel to furnish power for pumping. The oil, however, is such that it can be used only in heavy duty, slow speed Diesel engines which are very expensive, costing from two to three times as much as modern high speed Diesel engines. The modern Diesel engine, however, cannot operate upon the crude oil being pumped, and requires a special Diesel fuel.

"Certain installations utilize gas or gasoline engines as a prime mover for pumping. In this case, as in the case of a modern high speed Diesel, it is necessary to haul or pipe the fuel required to the pumping station, frequently over long distances and under adverse conditions, as well as high cost.

"One object of our invention is to provide a method and apparatus for pumping crude oil or petroleum in which a portion of the crude oil being pumped is bled from the pipe line and converted into a fuel for the prime mover.

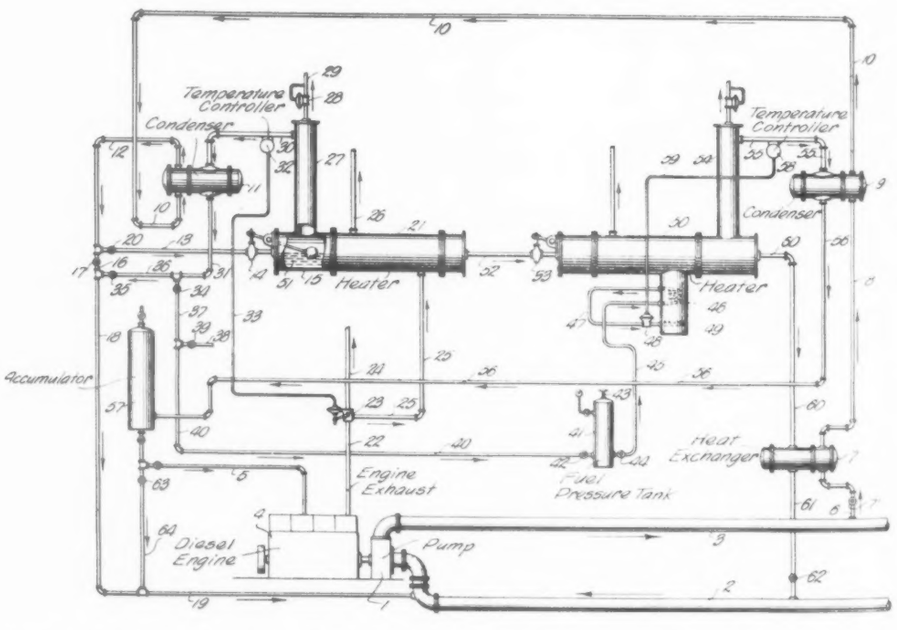
"Another object of our invention is to provide a method of obtaining a usable fuel fraction from the crude oil being pumped by means of utilizing only the heat in the exhaust of the internal combustion engine, or by utilizing, in combination with engine exhaust heat, additional heat generated from the combustion of a portion of the oil being pumped.

"Another object of our invention is to provide a contact pumping unit which may be readily installed at an isolated pumping station and under some conditions it is an object to provide a compact and portable or transferable pumping unit."

'Refinery' is Described

Claim 2 of the patent, which gives a typical description of the "refinery", follows:

"An oil distilling apparatus for supplying an intermediate fraction of a hydrocarbon oil to an internal combustion engine having a fuel inlet and an exhaust outlet for combustion gases, comprising a source of crude oil supply, a first still, a second still, means for conducting crude oil from the source to said first still, means for conducting the ex-



Crude flows through pipeline booster pump (1) via suction pipe (2) and discharge pipe (3), charging stock for "midget refinery" may be bled off at (6). It then flows through heat exchanger (7) and condensers (9) and (11), through float controlled valve)14) and into still (15), where it is further heated by exhaust heat from prime mover (4) in heater (21) which communicates with still (15). The vapors from still (15)—for most part gasoline fractions—pass through column (27), which may be packed or filled with fractionating trays as desired. Vapors then are condensed in condenser (11) and may be stored in accumulator (57) as prime mover fuel, or, they may be transferred to the suction side of the booster pump (1) through valve (35), or into fuel pressure tank (41) to be used in firing heater (50). Unvaporized oil in still (15) may flow to the second heater and still (50) via pipe (52) and float-controlled valve (53); the vapors produced there will pass through column (54) and condenser (9) into accumulator (57) for storage as prime mover fuel. Unvaporized oil in still (50) is passed via pipe (60) through heat exchanger (7) into suction side of pump (1). Excess fuel condensed also may be passed into suction side of pump (1) via pipes (64) and (19)

haust gases of the engine to the said first still for heating the contents thereof to a predetermined temperature, means including a burner, for heating the contents of said second still to a predetermined temperature, means for condensing the vapors from the first still and for conducting the uncondensed gases to the said heater whereby the uncondensed gases of the first still will constitute a source of fuel supply for the burner of the second still, means for passing unvaporized oil from the first still to the second still, and means for condensing vapors from the second still and for supplying the condensate to the said fuel inlet of the engine." Patent states units "are simple in operation and rather inexpensive of instaliation, are compact, light in weight and are readily portable."

The method and apparatus are described in Patent No. 2,284,809 assigned to Continental Oil Co. by J. G. Dyer and A. C. Wilkinson, applied for Oct. 19, 1939, and granted June 2, 1942.

* * *

769.12

Foam Directory Provides for Pooling Supplies in Oil Fire Emergency

A Foam Storage Directory has been prepared by the Petroleum Section of the Massachusetts Safety Council, by means of which, in the event of a major oil plant fire, the fire chief in charge could quickly learn where additinal supplies of foam are available, if needed.

This directory is considered such an important part of the war protection program for oil plants that in this state the Office of Civilian Defense is co-operating in the preparation of a new edition and the Navy has requested the Committee on Protection of Petroleum Facilities of the Petroleum Industry War Council to obtain similar information for all U. S. coastal states.

The following account of how the foam directory was developed in Massachusetts was prepared by George A. Lexander, Socony-Vacuum Oil Co., Inc., Boston, chairman of the Service Committee, Petroleum Section, Massachusetts Safety Council—Ed.

By George A. Lexander*

MOST fires of major proportions rarely include petroleum plants. Although many fire departments are trained and equipped to handle fires, the petroleum industry has done not only an admirable job in establishing its own plant fire brigades, but has spent thousands of dollars for foam and equipment to meet an emergency, especially at key plants.

All petroleum plants, whether large or small, are protected against incipient fires with a complement of suitable first aid fire fighting equipment. However, to attempt to protect every small or medium sized plant against a major fire with an adequate supply of foam, foam generators, etc., would be prohibitive. The Petroleum Section of the Massachusetts Safety Council recognized this fact several years back and, through its Service Committee, conducted a study of the problem. The result was the development of a Foam Storage Directory. Since the first edition it has been revised and reissued and, as changes have been rapid, a third edition is now being prepared through the co-operation of the Office of Civilian Defense.

At the outset, several of the major companies conducted a survey of the various plants and fire companies in the New England area to ascertain particulars as to foam powder on hand. Other factors which were included were the number and type of foam generators, foam applicators, size and quantity of hose. Details as to contact men were also asked for.

The first directory was no masterpiece and much difficulty was encountered in obtaining, as well as interpreting, information received from skeptical recipients of the questionnaires. However, after distribution of the first directory, the Service Committee received requests for copies far in excess of the first run. The second issue was distributed, with the request that errors or ommissions be noted and that proper information be sent the committee, so that, ultimately, the directory would be up-to-date and accurate.

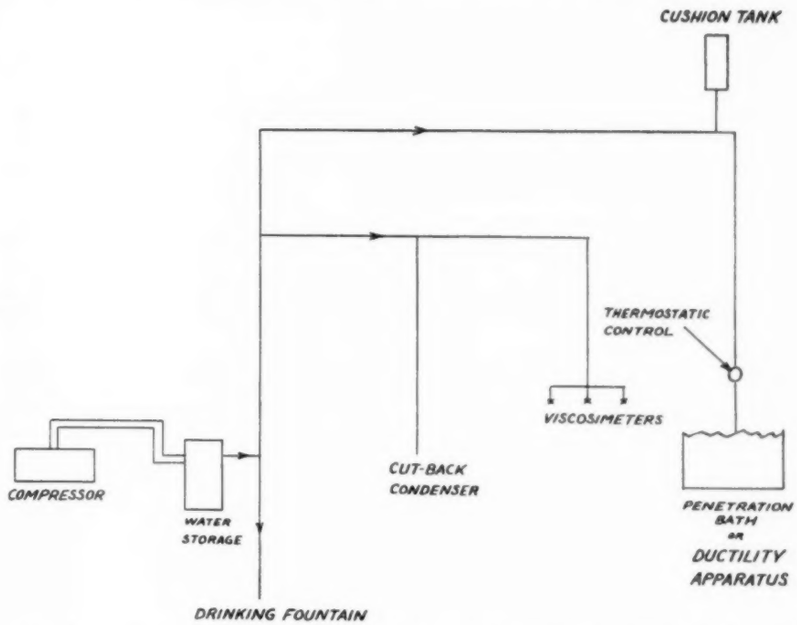
Weaknesses Revealed

If nothing else has been accomplished, the honest attempt to obtain the information necessary for the questionnaire revealed many weaknesses in what was considered fire protective material. Hose that was unreeled for the first time in years to determine measurements and lengths in many instances was found deteriorated to such an extent that it was unfit for use. Many incorrect size hose couplings were found. Hose nozzles were missing. Gaskets were missing or badly deteriorated. All in all, much good was accomplished in developing additional emphasis on fire protection.

The intent of the Foam Directory is that it may serve a purpose similar to that of the Fire Departments' Mutual Aid; in fact, many fire officials have stated that it dovetails in with this service, particularly with respect to petroleum fires. In the event of a major oil fire, the fire chief in charge can quickly observe from his Foam Directory where the source of foam is available if an additional supply is needed. Information is also included as to the contact men to whom requests for foam can be directed.

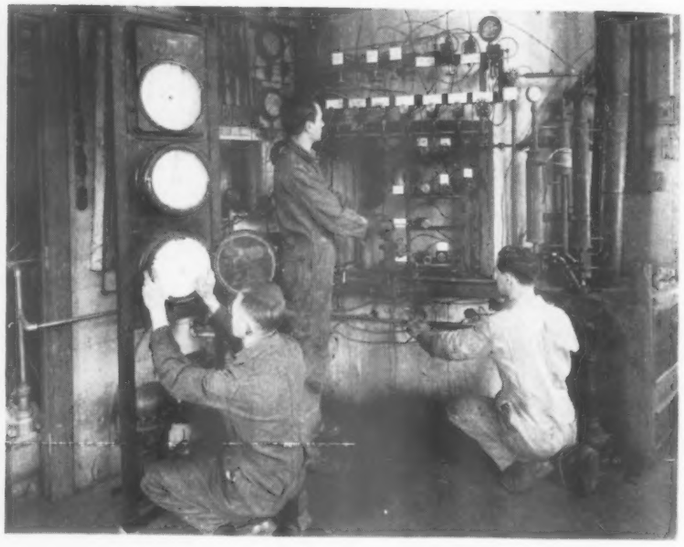
*Socony-Vacuum Oil Co., Inc., Boston, Mass.

Cooling System for Asphalt Laboratory Equipment

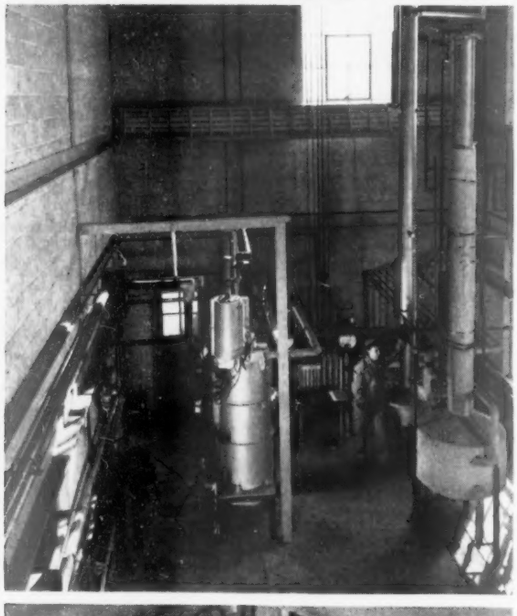


Flow diagram of thermostatically controlled cooling system developed by Latonia Refining Corp. (Standard Oil Co. of Ohio) for asphalt laboratory equipment. In summer, especially when hydrant water temperature is above 77 deg. F., a thermostatically controlled solenoid valve releases cold water from the refrigeration unit into the penetration bath or ductility apparatus (not shown) until the desired operating temperature is reached. Using this cooling system, ductilities, for example, can be run at 32 deg. F., 39.2 deg. F., and 41 deg. F. with "considerable accuracy", it is said. Other laboratory equipment may also be supplied from this cooling system, as shown in the flow diagram

Conversion of Coal by Hydrogenation Described As



Control room, coal hydrogenation plant. Gas and liquid control manifolds are in the center; heavy oil receivers are in cabinet at far right



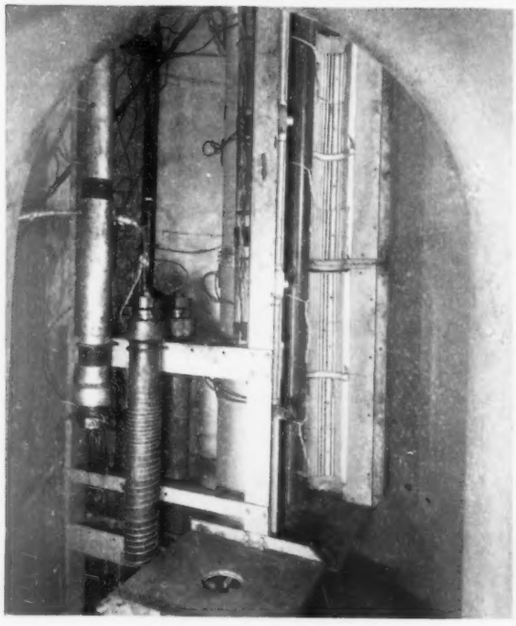
Top left—Preparing for coal hydrogenation. Coal is being pulverized in ball mill at right; coal-heavy oil slurry is being prepared at left

Hydrogen production unit. Natural gas and steam react in chamber at left, carbon dioxide is removed in columns at right

Bottom left—Hydrogenation unit, showing converter in place in electric furnace; gas holders and auxiliary equipment on left. **Directly below**—Converter, standing vertical

LIQUID hydrocarbon products, extracted from coal after hydrogenation, can provide the nation with large supplies of gasoline and lubricating oils, butadiene for synthetic rubber, substances useful for explosives manufacture, synthetic fibers, paint thinners, lacquer solvents, drugs and medicinals, perfumes, plastics, wood preservatives, flotation agents, benzene, toluene, dyes, and other products, U. S. Bureau of Mines officials testified June 17-18 before a subcommittee of the House mines and mining committee. The subcommittee, headed by Rep. Jennings Randolph, W. Va., was investigating the feasibility, at some future time, of producing from coal the products now secured from petroleum.

Experimental results from the hydrog-



Some of the products obtainable from coal liquefied through hydrogenation. Many chemicals used in manufacture of dyes, drugs, explosives, paint thinners, lacquer solvents, synthetic silk and plastics are obtainable from coal, as well as gasoline and fuel oil. Girl is holding bottle of perfume made in part from chemicals obtained from coal

All photographs on this page—courtesy U. S. Bureau of Mines

As a Future Source of Hydrocarbon Products

enation of coals of various grades were described to the subcommittee by Dr. A. C. Fieldner, chief of the Bureau's coal division, and by Dr. H. H. Storch, director of its "coal-gasoline" experimental plant at Pittsburgh. Experimental work has been carried on there for several years, Dr. Storch said. Capacity of this plant is about 7 gal. of gasoline per day from direct hydrogenation of coal.

Experimental results on 13 various grades tested indicate gasoline yields ranging from 63 to 136 gal. of gasoline per ton, according to latest Bureau report. Largest yields have been secured from high volatile bituminous grades, lowest from subbituminous and lignites.

The process used in this experimental work is similar to that used by Germany and other European countries which derive much of their motor fuel and lubricant supplies from coal hydrogenation. However, Bureau officials pointed out that only petroleum can supply aviation fuels and lubricants of required quality.

In brief, the process consists of mixing approximately equal parts of a clean, pulverized coal with a heavy tar-oil, pumping the resultant slurry together with hydrogen under 200 to 300 atmospheres pressure into a vertical alloy-steel tube heated to 806-842 deg. F., where contact time as well as temperature are adjusted for maximum yield of oil. The oil is carried out of the converter by the hydrogen stream after reaction.

The first yield, or overhead from the converter, comprises about 20% of material boiling in the gasoline range (to 401 deg. F.) and approximately 80% boiling from 401 deg. F. to more than 626 deg. F. as shown in Table 1. This latter material, or "medium oil", can then be cracked and fractionated to yield more gasoline, diesel oil, fuel oil, tar bases, tar acids and other substances.

Table 1* shows the quantity of tar acids, tar bases, neutral aromatic oils and gas obtained, on ash and moisture-free coal basis, together with quantity of hydrogen consumed with the type and rank of coal.

Table 2 shows the analysis of the overhead oil, made to determine the boiling-point distribution of tar acids and bases, aromatics and other constituents of the oil. It will be seen that the higher-boiling fractions are entirely naphthenic.

Catalysts used are suspended with pulverized coal in the heavy oil. According to the latest report from Bureau experimenters, catalysts used are iodoform, stannous sulfide, molybdenum trioxide and molybdenum disulfide, in amounts ranging from 0.05 to 0.5%. But little effect on results was noted with use of the molybdenum oxides or sulfides with 0.05% iodoform plus 0.1% stannous sulfide, compared with use of 0.05% CHI_3 + 0.1% SnS alone.

Good Octane Rating

Gasoline obtained is said to be a high-quality product, readily usable in internal combustion engines of the automobile type. It has an octane rating of about 68 ASTM, requiring 3 cc. tetraethyl lead to reach about 80 octane. Reports are that higher octane numbers can be reached by proper catalyst selection for second-stage hydrogenation, but the limit is expected to be 90. Road tests in Army tanks of the 80 octane material are said to equal in performance 92-octane gasoline from petroleum, because of its relatively large aromatic content.

Yields are reported of from 7.5 to 12 gal. of gasoline per ton of coal on basis of overall total amount of coal used in process. This includes the use of coal for actual hydrogenation, for hydrogen production, steam production, heat and power. Yields of from 63 to 136 gal. of gasoline per ton of coal, mentioned earlier in this article, are when basis is solely weight of coal actually hydrogenated.

Gasoline production costs, under commercial operation, are variously estimated and range from 12c to 25c per gal. The general prevailing estimate is said to be 18c per gal. based on operations of coal processing plants in England. The heavy oil, in which the pulverized coal and catalyst particles are originally suspended, is centrifuged upon coming from converter and is ready to be mixed with another charge of coal and catalyst.

*Hirst, L. L.; Boyer, R. L.; Eisner, A.; Pinkel, I. I.; and Storch, H. H., "Hydrogenation of High Volatile Bituminous Coals", Ind. Eng. Chem., 33, 1068-72 (1941).

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Table. 1 Hydrogen Used and Yield of Tar Acids, Tar Bases, and Total Aromatic Neutral Oil

Coal Rank*	Bed and State	Oxygen	Hydrogen Used	Tar Acids			Nitrogen	Tar Bases	Total Aromatic Neutral Oil†	Gas
				Total yield	Distilling To 235° C.	Distilling 235-300° C.				
		Per cent of moisture- and ash-free coal								
H. V. A bit.	Mary Lee, Ala.	5.0	8.5	7.6	4.3	2.6	1.8	2.5	32.8	27
H. V. A bit.	Upper Freeport, W. Va.	5.7	12.0‡	5.3	2.9	2.1	1.5	2.0	34.8	26
H. V. A bit.	Pittsburgh, Penna.	6.8	9.0	12.2	7.5	3.7	1.7	2.8	40.9	21
H. V. A bit.	Black Creek, Ala.	7.5	12.1‡	8.4	4.1	2.5	1.8	1.7	30.8	20
H. V. B bit.	Lower Sunnyside, Utah	9.5	7.5	10.9	5.1	4.0	1.6	2.6	29.8	13
H. V. C bit.	No. 4 Ind.	9.5	9.0	11.7	5.6	4.3	1.7	2.3	31.5	20
H. V. B bit.	No. 6, Ill.	10.0	8.5	15.1	6.0	4.2	1.9	1.7	37.1	17
H. V. C bit.	McKay, Wash.	12.5	7.6	14.6	6.0	5.0	2.2	3.7	27.7	22
Subbit. B	Puritan, Colo.	16.4	9.7	12.6	7.4	4.2	1.6	2.8	28.2	26
Subbit. B	Rosebud, Mont.	16.2	7.5‡	13.8	7.6	5.4	1.1	2.1	26.4	19
Subbit. B	Monarch, Wyo.	16.9	8.5‡	17.2	8.2	6.0	1.5	3.1	25.4	25
Lignite	Beulah, N. Dak.	19.4	8.0	12.0	5.6	5.2	1.0	1.6	23.5	28
Lignite	Velva, N. Dak.	21.2	7.0‡	15.6	8.4	6.3	1.0	1.6	22.1	28

*H. V. = high-volatile; bit. = bituminous; subbit. = subbituminous.
†In calculating total aromatics it was assumed that overhead oil boiling over was 80 per cent aromatic.
‡Assayed at 4500 pounds per square inch hydrogen pressure; all other tests at 3200-3350 pounds.

Table 2. Special Overhead Oil Analyses (Per Cent by Volume)

Boiling Range °C.	Fraction: % of total overhead oil	Fraction: Sp. gr. at 15.6° C.	% in Fraction: Tar acids	% in Fraction: Tar bases	% in Neutral Oil: Olefins	% in Neutral Oil: Aromatics	% in Neutral Oil: Saturates	Saturates: Refractive Index at 20° C.	Saturates: Rings per mol. of naphthenes	Saturates: % of naphthenes
Upper Freeport, Runs 67-6, 67-7, and 67-8										
20-188	26.9	0.802	5.2	2.8	8.0	27.4	64.6	1.4250	1	61
188-207	4.9	.....	20.0	6.3	8.0	59.0	33.0	1.4500	1	100
207-235	10.3	0.932	16.5	3.6	6.0	69.4	24.6	1.4553	1	100
235-270	14.7	0.947	11.5	2.0	4.2	78.8	17.0	1.4627	1	100
270-300	19.1	0.966	7.0	1.5	4.0	85.0	11.0	1.4690	1.5	100
Black Creek, Runs 64-6 and 64-7										
20-188	25.1	0.793	4.8	3.8	7.0	22.0	71.0	1.4235	1	57
188-207	7.4	.....	23.6	6.2	4.4	56.0	39.6	1.4475	1	100
207-235	11.8	0.933	23.0	5.5	4.4	67.6	28.0	1.4533	1	100
235-270	14.8	0.947	15.0	3.0	3.0	77.4	19.6	1.4590	1	100
270-300	17.2	0.961	8.0	2.0	5.4	81.0	13.6	1.4644	1.4	100
Lower Sunnyside, Runs 61-9, 61-10, and 61-11										
20-188	26.0	0.792	5.4	3.6	10.6	18.0	71.4	1.4223	1	51
188-207	5.9	.....	28.2	4.5	7.0	45.0	48.0	1.4468	1	97
207-235	13.8	0.933	28.5	3.5	5.0	59.0	36.0	1.4526	1	100
235-270	17.2	0.948	20.0	5.0	5.6	69.8	24.6	1.4585	1	100
270-300	16.2	0.964	12.5	3.0	7.0	73.0	20.0	1.4635	1.3	100
Indiana No. 4, Runs 70-8, 70-9 and 70-10										
20-188	23.0	0.795	6.5	3.0	8.4	22.0	69.6	1.4252	1	59
188-207	7.2	.....	40.2	3.5	7.0	50.0	43.0	1.4450	1	91
207-235	11.5	0.940	30.5	2.5	6.0	62.6	31.4	.....	...	...
235-270	16.8	0.952	21.0	3.0	5.0	72.6	22.4	1.4520	1	100
270-300	18.2	0.968	14.0	1.5	5.4	76.6	18.0	1.4580	1	100

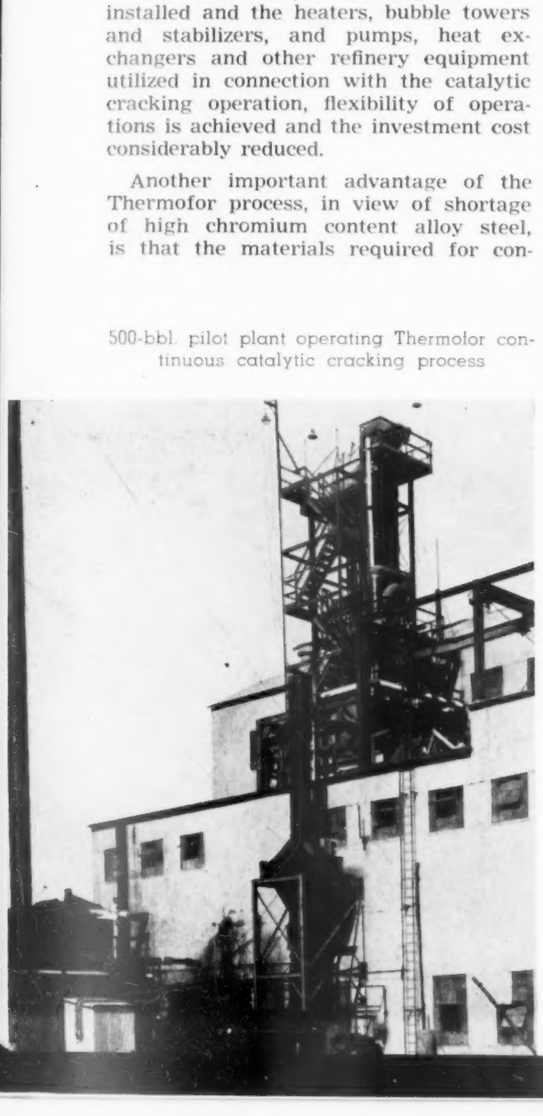
Adaptation of the Houdry Process Provides Continuous Cracking

RECENT development work has demonstrated the practicability of the new Thermofor continuous catalytic cracking process as a means for supplying the essential wartime products; namely, base stocks and raw materials for alkylates for 100-octane gasoline, the butane-butylene raw material for processing into butadiene for synthetic rubber, and also material from which nitration grade toluol can be separated. A number of these plants are now under construction, some for independent refiners. The Thermofor process is an adaptation of the Houdry cracking process and the Thermofor kiln to provide continuous cracking and regeneration of the catalyst.

Early development of the process by the Socony-Vacuum Oil Co. was for the production of a maximum yield of high quality motor gasoline and minimum yields of the lighter gaseous materials from various gas oil charging stocks. The operation of the process for the maximum butane-butylene cut requires higher but practicable operating temperatures. In refineries where existing thermal cracking operations can be discontinued when catalytic cracking units are installed and the heaters, bubble towers and stabilizers, and pumps, heat exchangers and other refinery equipment utilized in connection with the catalytic cracking operation, flexibility of operations is achieved and the investment cost considerably reduced.

Another important advantage of the Thermofor process, in view of shortage of high chromium content alloy steel, is that the materials required for construction are largely carbon steels with only a limited amount of 5% chromium steel for the tubes and interior of the catalyst regenerating kiln. Other materials required are simple structural forms, light steel plate, gray iron castings, low chromium and non-ferrous alloy tubing and light sheets. Electrical and mechanical equipment, including pumps, drivers and instruments is of conventional design in oil refineries.

500-bbl. pilot plant operating Thermofor continuous catalytic cracking process



In addition to a low catalyst cost, averaging about 3c a bbl. of charge, operating costs are further reduced through the conversion of waste heat into steam. In one plant handling approximately 15,000 bbls. daily of reduced crude and 10,000 bbls. of recycle gas oil, from 52,000 to 65,000 lbs. per hour of 450-lb. steam are developed and approximately 15,000 lbs. of 150-lb. steam, all from waste heat.

Essential parts of one plant built to operate this process include a tar stripper, furnace, reactors, Thermofor kilns, catalyst circulating system, fractionator and stabilizer for either stabilizing or debutanizing a 300 or 400 end point gasoline. In addition, the design calls for removal from the bubble tower of a product meeting No. 2 fuel oil specifications without additional treatment. The reactors and kilns are designed in three capacities, for handling 2500 bbls. per day of total gas oil charge, 5000 bbls. and 10,000 bbls.

Thermofor Kiln Adapted

The most unusual feature of the process is the adaptation of the Thermofor kiln, originally developed by Socony-Vacuum and used today for the revivification of the filter clay in lubricating oil plants, to the regeneration of the catalyst used in the cracking operation. Mechanical means are provided for moving the bed of catalyst continuously through the reaction chamber and thence through the kiln for regeneration. The catalyst material is much coarser than is used in lubricating oil filtering operations. Based on experience to date, a time factor as high as 95% can reasonably be expected in commercial units operating this process. The catalyst makeup is estimated to be between 0.5 lb. and 1 lb. per barrel of total feed charge to the reactor. The gas oil charge, in some operations at 800 to 875 deg. F. temperature, is passed through the reactor counter-current to the moving bed of catalyst.

"The Thermofor kiln is said to embody features of positive temperature control, burning rate and heat transfer that suit it admirably for the regeneration of percolation clays at high temperatures (900 deg. to 1200 deg. F.)", stated an article describing it, published in 1939.*

"The application of the Thermofor kiln is not restricted solely to the handling of clays", said this article, "as there are numerous uses to which it might be applied in other industries for the treatment of finely divided solids under controlled conditions at high temperatures." In this respect, it was stated that the kiln should find important commercial chemical-engineering applications beyond the scope of the petroleum industry.

Claim Burning Cost Saving

Substantial savings in burning costs are claimed for the Thermofor kiln when used for regenerating clay from a percolation filter, fuel consumption being negligible because the heat is obtained from the burning of the absorbed carbonaceous material in the clay. The only outside heat supplied is for bringing the burner up to temperature and for hardening of raw clays.

In recent development work to demonstrate the practicability of the Thermofor cracking process in producing base stocks and alkylate for aviation gasoline, butylene for synthetic rubber, and toluol, many runs were made on various types of gas oil, both once through and recycling. The results showed the process may be run for (1) maximum 400 end point gasoline with high liquid recovery, (2) at higher temperatures for the production of the maximum cut of butane-butylene with high percentages of butylene or (3) in some intermediate condition.

Yields Described

In once-through operations, yields of from 35 to 45% of 400 e.p. gasoline may be made from gas oils with end points as high as 900 deg. F. and, with recycling, yields of from 50 to 60% of 400 e.p. gasoline may be recovered. The recycling operation may also be employed at higher temperatures to obtain high yields of butane-butylene cut with high percentages of butylenes. The butane-butylene cut varies from 6 to 15% by volume of the gas oil charge for normal operations and is 20 to 25% in some instances for the high temperature operations. The 300 end point fraction in the debutanized 400 e.p. gasoline will vary from 55 to 75%. By retreating, a high proportion of the 300 e.p. gasoline is obtained as aviation base stock.

The investment for entirely new plants where the Thermofor cracking process is installed is said to average around $120 per bbl. of gas oil charging stock. Where the Thermofor reactor and kiln and catalyst circulating equipment are adapted to existing thermal cracking equipment, the investment cost for the Thermofor reactor and kiln and catalyst circulating equipment is considerably reduced.

The Thermofor catalytic cracking process is licensed to oil companies by the Houdry Process Corp., through the Lummus Co., New York, and E. B. Badger and Sons Co., Boston, refinery engineers.

* "New Thermofor Kiln and Clay-Regenerating Processes for Maintaining Decolorizing Clays at High Efficiencies", by T. P. Simpson and J. W. Payne, Socony-Vacuum Oil Co., presented at 20th annual meeting, American Petroleum Institute, Chicago, Nov. 16, 1939.

Turbines Generate By-Product Power From Refinery Process Gases*

By John Goldsbury * * and J. R. Henderson * *

The trend toward fuel economy in modern petroleum refineries, caused by the processing of gases formerly used for fuel and by the elimination of unsalable fuel products formerly consumed, has brought about various developments for the generation of by-product power.

A recent example is the installation of turbines to derive power from the expansion of process gases. The natural gas industry is seen as another large potential field for the development of by-product power by this means. While the thermodynamic properties of the gas will have an important effect on the design of the turbine, it is said provision can be made for efficient utilization of almost any gas through wide ranges of flow, temperature, pressure and pressure drop, without exceeding the limits of stress and rotational speed encountered with steam turbines.

The application of turbines for power generation from refinery gases presents particular problems where there are corrosive components in the gas. These call for the use of special materials in construction and operation of the turbine at exhaust temperatures well above the condensation points of any acids likely to be present in the gas. Special precautions must also be taken because of the inflammability of the gas. The power produced in most cases must be used by the unit producing it because the source of power will be eliminated when the unit is shut down.

MANY modern industrial processes involve the production or use of gases or vapors under pressure. It is apparent that certain desirable reactions take place more effectively under pressures above atmosphere. In some cases, the gain in the quality or quantity of the product seems to be well worth the cost of air or gas compression. In the case of natural gas, the compression, as well as the gas itself, is contributed by nature. In any case, when a continuous flow of gas is available under pressure above atmosphere, it will be well to consider whether advantage cannot be derived from expanding the gas through an elastic-fluid turbine.

This term "elastic-fluid turbine" is used to denote the general class of turbines which are operated by the expansion of any gas or vapor. The general features are the same as those of the steam turbine, but the dimensions, materials, and design details will be determined by the particular elastic fluid used, as well as by the pressures and temperatures involved.

Not only may it be found that the use of a turbine will improve some established processes or increase the economy of operation, but the possible advantages of a turbine may turn the balance in favor of new processes being considered.

In some cases, certain difficulties may arise, such as corrosiveness of the gas, presence of liquid, gummy, or solid particles carried by the gas, or arising from physical or chemical changes, etc. If, however, the advantage of using the gas in a turbine is great, ways of overcoming difficulties can frequently be found.

In general, the justification for a turbine would be the power which it could produce, but an increasing number of processes are being considered in which the advantage of the turbine is the reduction in gas temperature due to the energy absorbed by the turbine. At least one such application has been made and several others have been considered.

Application in Petroleum-Refining

The most important development so far in the use of turbines, driven by industrial-process gases other than steam, is found in connection with certain catalytic petroleum refining processes. In these processes carbon is deposited on the catalyst. The carbon must be burned off and the catalyst regenerated at frequent intervals. In several of these processes, it is apparently most effective and economical to burn off the carbon under pressure. In some cases, the pressure is as high as 300 psi, and much higher pressures have been proposed.

Several catalyst retorts are frequently used so that one or more can be undergoing the regeneration processes continuously. The maximum regeneration temperature is controlled either by tubes through which a coolant is passed, or by recirculation of some of the products of combustion which have passed through a waste-heat boiler, or by other suitable means. There is, then, a steady flow of these products of combustion or flue gas which is of no further use to the process.

The heat could, of course, be partially recovered in a waste-heat boiler or other type of heat exchanger, but the pressure potential would be largely wasted. The pressure potential can be utilized and a large portion of the heat removed by passing the gas through a turbine.

Fig. 1 shows a 3500-hp. flue-gas turbine on the test floor. A cross-sectional view through this turbine is shown in Fig. 2. The following description indicates some of the problems which must be considered in connection with such turbines.

With some grades of process charge, sulphur will be deposited on the catalyst. This will appear as SO_2 in the flue gas. In order to avoid corrosion from this, as well as from any other possible corrosive component in the gas, it was decided to make the rotor, buckets, nozzles, and some other parts of this particular turbine of a high grade of stainless steel, while a low-alloy steel was used for the casing parts. Valve trim was of stellite, interior packings were of a special cast iron, and outer shaft packings of carbon. Recent tests have indicated that less expensive and more easily workable materials will probably be suitable for many of the parts when the corrosive components of the gas are only SO_2 and water.

As further protection against corrosion it is planned in so far as possible to operate the turbine only at exhaust temperatures well above the condensation points of any acids likely to be present in the gas. When the turbine is to be shut down for any extended period, hot dry air or neutral gas will be blown through the casing, packing glands, valves, etc., to purge out all traces of the gas, and precautions will be taken to prevent any gas from leaking into the turbine during such periods.

Although no solid materials in appreciable quantities are expected to be entrained with the gas, provision has been made for the admission of air to the shaft-packing glands, if that is necessary to prevent such material from settling in the packings. Space has been provided for assembly of special interstage packings which can also be sealed with air if experience indicates the need.

Designed for Simplicity

Because of the large coefficient of thermal expansion of the stainless-steel rotor, it was necessary to use particular care in designing packing and other clearances to prevent any possibility of rubbing, even under large and rapid changes in load or operating conditions. In general, the turbine was designed for simplicity and ruggedness rather than highest efficiency. The first of the three stages is velocity-compounded with two rotating bucket rows and with circular nozzle ports. Maximum turbine efficiency, together, doubtless, with other

*This is a portion of a paper published under the title "Turbines for Power Generation from Industrial-Process Gases", in the Transactions of the American Society of Mechanical Engineers, for May, 1942. The paper was presented at the meeting of the Society at Louisville, Oct. 12-15, 1941, and is now released for publication.

**Turbine Engineering Dept., General Electric Co., Lynn, Mass.

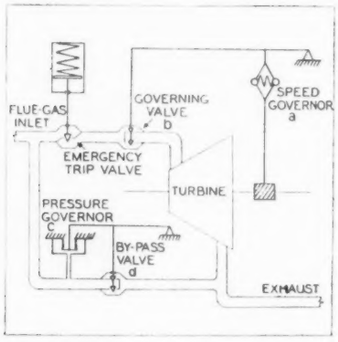


Fig. 3. Control diagram for 3500-hp flue-gas turbine

refinements contributing to plant economy, can come later, when the experience necessary for determining the best overall arrangement is available.

Fig. 3 shows the control arrangement for this turbine. The mechanism is such that speed can be held constant at any set value within the setting range of the governor, in this particular case, from 2800 to 4000 rpm. The speed governor **a** controls a single admission valve **b** through an oil operating cylinder, not shown. In order to assist the speed governor in holding constant speed in spite of large variations in gas-main pressure, a constant-pressure governor **c** is used to control the pressure ahead of the speed-governing valve. The pressure governor controls a valve **d** which by-passes excess gas around the turbine. Fluid-restoring links, not shown in the diagram, permit very close net speed and pressure regulation, combined with instantaneous regulation which is broad enough to be stable.

This particular turbine was designed to be installed out-of-doors, and the sheet-metal lagging, oil-tank cover, etc., were consequently made weatherproof.

Details of 885-hp. Turbine

In Fig. 4 is shown the control diagram for another flue-gas turbine of 885 hp. capacity. In this case, a 1460-hp. steam turbine is coupled to the same shaft for starting and for supplementing the gas-turbine power.

Referring to the diagram, it will be seen that both turbine admission valves, **b** and **d,** are controlled by one speed governor **a,** through oil relays. The linkage is arranged in such a manner that the gas-turbine valve **d** opens first, the steam-turbine valve **b** then opening to whatever extent is necessary to make up the difference between the load required and the power which can be obtained from the gas turbine under the particular conditions considered. The steam valve has an overtravel in the closed position, so that it does not lift above its seat until the gas valve is nearly wide open.

Overspeed Governor Provided

Although there is only one speed governor, a separate emergency overspeed governor is provided on each turbine, to prevent runaway of either turbine in case of loss of its load. The emergency governor **f** on the gas turbine will dump the oil pressure from the gas-admission-valve cylinder **e** only, while the emergency governor **g** on the steam turbine will dump the oil pressure from both the gas **e** and steam **e** admission-valve cylinders, to cover the case of complete loss of load on the compressor.

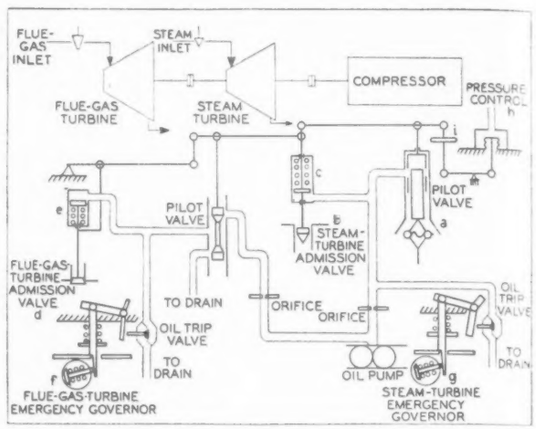


Fig. 4. Governing mechanism for dual-drive flue-gas turbine and steam-turbine compressor set

The governing mechanism also includes a device, not shown in Fig. 4, to admit a small steam flow to the steam turbine to carry away the heat resulting from windage of the buckets, rotating idly while the compressor is being driven by the gas turbine. Steam is also supplied to the shaft seals of the gas turbine, to prevent leakage of gas.

The speed setting of the governor **a** can be regulated either automatically by the pressure control **h** or manually by the handwheel **i.**

Natural Gas Turbiln Operation

Another large potential field for power from expansion of gas through turbines is the natural gas industry. It has been calculated that the total work which might theoretically be thus extracted from the annual production of natural gas in the United States is of the order of 1,750,000,000 kwhr. Numerous very small turbines of standard steam designs

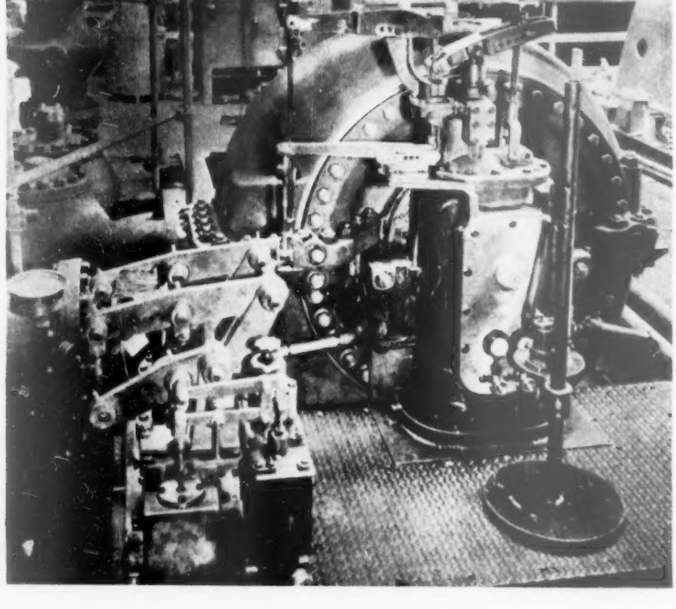


Fig. 1 (left). A 3500-hp flue-gas turbine, of the type used to generate power from refinery gases

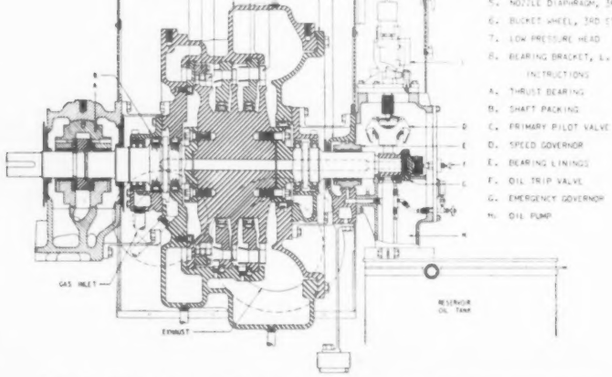


Fig. 2. Cross-sectional view through 3500-hp flue-gas turbine

are being operated by natural gas and used to drive pumps and other apparatus. However, there are undoubtedly many cases where no power is derived from the expansion of the gas, but where the pressure drop from the well to the point of use is much greater than is really needed to overcome friction losses in pipes of reasonable size.

In the repressuring process of liquid extraction from natural gas, well pressures run from 1500 to 3000 or more psi., while the pressure in the absorption tower is usually from 1000 to 1500 psi. Since the amount of liquid extracted increases with decrease in temperature, any power extracted by passing the gas through a turbine would contribute also to the yield. The turbine could be designed to separate out a large portion of the liquid from the gas by centrifugal force, and might thereby replace one or more of the extraction devices normally used. Taking a case where 50,000,000 cu. ft. of free gas per day are processed with a gas-main pressure of 2000 psi., dropping down to 1000 psi. at the absorption towers, if we assume a temperature of 100 deg. F. at the main and a net pressure ratio of 1.8 for the turbine after allowing for pipe losses, the net power obtainable will be approximately 650 hp.

(The portion of the paper which is omitted here presents a nomograph which can be used for rough work to obtain quickly the approximate turbine outputs from given quantities of gases at various temperatures and pressure ratios. A formulation has been introduced whereby turbine efficiency is included on a basis which gives approximately the correct characteristic with respect to size, but of necessity many variables cannot be evaluated in such a chart, the authors state.

For more accurate determinations the paper presents a simple method for calculating the expansion energy available in a pure or compound gas for specific operating conditions; also it gives the properties of various gases, for use in such calculations. After a study of the available data on gas properties, the authors have selected for the working curves those which were considered to be most authentic.

There is given in the appendix an example of the derivation of turbine output by the use of the nomograph. For comparison the same example is worked out by the method described.)

Discussion*

By D. J. Bergman, Engineering and Development Dept., Universal Oil Products Co.

From the viewpoint of the turbine manufacturer this presentation gives valuable information for establishing the power available from gas or vapor under pressure in industrial plants.

The subject is especially interesting, at the present time, to the oil refiner. For a number of years the refinery industry has been improving the efficiency of its processes. In recent years, gas formerly burned in field torches has been processed in newly developed plants for the production not only of motor fuel but aviation fuel and chemicals as well. This has reduced the refiner's available fuel supply.

A further reduction has come about through elimination in large part of acid-treating and improvement of residual fuels to the point where there is practically no unsalable fuel product produced in a refinery. This has changed the refiner's fuel picture from one of disposal of a product for its nuisance value to that of the need for rigid economy in minimizing the use in the refinery of otherwise salable products. In line with the increasing trend toward fuel economy has been the installation of superheaters, steam generators, and the use of exhaust steam from other services in low-pressure turbines.

Under present conditions with the government's call for tripling the aviation-fuel capacity in this country, yet greater reduction in refinery-gas supply must result, and direct generation of power will be one answer to the problem.

Application of a turbine directly in a refining process, using gas or vapor, involves a number of considerations which do not occur in connection with generating power by steam. Aside from the very different thermodynamic properties of the material there are problems due to corrosion, dust, high temperatures, refrigeration of gas, formation of hydrates, and the hazards involved in using combustible materials.

Natural gas has been used as a motive power for driving pumps in many instances, particularly in connection with the natural-gasoline industry. However, leakage past stuffing boxes has been rather a serious matter and at least one bad refinery fire has occurred as a result. Where leakage of steam would be of no consequence whatever, careful thought must be given to the possible effects of leakage of combustible gas, and provisions for ventilation or sealing fluids must be made to cut down the hazards. In many cases, special alloys will be required because of the corrosive properties.

* * *

By P. V. Keyser, Jr., Technical Service Division, Socony-Vacuum Oil Co., Brooklyn, N. Y.

The authors have presented a method of estimating the energy available in gases under pressure for deriving power by the use of suitable expansion turbines. The work is of considerable engineering value for future developments in this field. In addition, the authors suggest specific applications for equipment of this type in process industries.

In this connection some comments regarding the use of gas turbines in catalytic cracking may be of interest. In our domestic refineries we now have nine gas-operated turbines, generating a total of more than 25,000 hp. and several more are under construction.

These turbines are used on Houdry catalytic cracking units. Their purpose is to drive the 2500-hp. compressors which provide compressed air for burning deposits from the catalyst. The gas turbines are driven by the compressed air after it has served its purpose in the catalyst cases.

There is some pressure drop through the catalyst cases, but the temperature of the air increases during the burning operation so that enough power is usually derived from the regeneration gases to compress the air. It can be seen that a considerable saving in power is realized in this operation by the use of gas turbines.

The regeneration gases used to drive the turbines vary considerably in composition, being rich in CO_2 and poor in O_2 at the start of regeneration, and poor in CO_2 and rich in O_2 at the end of regeneration. The average composition is approximately as follows:

	Per Cent
Water vapor	8
Carbon Dioxide	10
Oxygen	7
Nitrogen	75
Total	100

Some of these turbines have been in operation for more than 2 years and have given remarkably little trouble, considering the high rotational speeds at which they operate.

As for possible uses for gas turbines the petroleum-refining industry offers many applications where power could be derived from high-pressure gases. The disadvantage in most cases is that the power produced must be used by the unit producing it, because the source of power will be eliminated when the unit is shut down for cleaning out or inspection.

If, for instance, the power is used to generate electricity for use at the refinery, there must be some source of power during shutdowns of the unit producing the power. Demand charges of public-utility companies, or auxiliary-equipment costs, will often seriously reduce the savings made by use of the turbines.

One other problem in using gas turbines at oil refineries, even when the power is used at the unit producing the power, is that outside power must be used in many cases when starting up the unit.

For the turbocompressors at the Houdry units, a burner is placed in the compressed-air line, so that the air can be heated even though no deposits are being burned. Also, a steam turbine or electric motor is connected to the system for use in starting. No doubt, similar solutions could be found for problems in connections with other applications of gas turbines in oil refineries.

The potential savings possible by using gas turbines in oil refineries are large. The principal reason why such installations have not been made in the past was doubt as to their reliability. The losses which would be suffered if a large cracking unit had to be shut down because of a gas-turbine failure, would outweigh any savings which could be made by using the turbine. Now that gas turbines have been proved reliable, we believe that such installations will be made in increasing numbers in the future.

*This discussion followed the presentation of the paper at the meeting of the American Society of Mechanical Engineers, Louisville, Oct. 12-15, 1941.

Standard Engine Test for Heavy-Duty Crankcase Oils Proposed by A.S.T.M.

FOUR new standard testing methods for petroleum products have been made available for the use of oil companies and their industrial consumers through the past year's work of the oil group of the American Society for Testing Materials. These methods aid oil companies in determining that the most suitable lubricants and other products are supplied for the machines, tools and instruments of war.

The four new test methods, which are only a part of the continuous work of Committee D-2 on Petroleum Products and Lubricants of the A.S.T.M. in revising and bringing up to date all the standard test methods for petroleum products, are as follows:

1—A standard method of laboratory engine test for the oxidation characteristics of crankcase oils designed for heavy-duty service in trucks, buses, military and other vehicles.

2—A standard method of test to determine the ability of steam turbine oils to aid in preventing rusting of turbine parts when the water becomes mixed with the oil.

3—A standard test to determine the percentage of oil in paraffin wax, which is of use in the control of the various steps in the separation of oil and wax, as well as in evaluating waxes for special uses.

4—A standard method of test providing for the use of a photoelectric colorimeter in determining the color of lubricating oils.

One out of Four Adopted

Of the 4 new tests, that to determine the rust-preventing characteristics of steam turbine oils was adopted as tentative standard at the annual meeting of the A.S.T.M. in Atlantic City, June 22-26. The other 3, under the usual procedure of the Society, are approved for "publication as information only". Having been endorsed by the committee on petroleum products as giving accurate results, as capable of being carried out in different laboratories with uniform findings, and as fair to all manufacturers, the test methods are now proposed for general use by oil companies. Comment and criticism is solicited by the Society, in order that the test methods may be revised or amended before being made official standards.

In addition to these 4 new test methods, revisions in several of the standard testing methods already in use were announced at the A.S.T.M. meeting.

This organization is the national technical society of engineers, chemists, testing experts, manufacturers, large consumers and others for the study of the materials of engineering and the standardization of specifications and the methods of testing for these materials. Its standards are universally recognized and used.

Committee D-2 has 60 oil company chemists and engineers in its membership of 95, the others being representatives of industrial consumers and of scientific institutions. The Society's membership has endorsed for petroleum products approximately 80 standard testing methods, and 12 standard specifications.

The interest and activity of petroleum technologists in the work of "D-2" is far wider than the contributions of the approximately 60 oil company members of the committee, who give a good part of their time, year in and year out, to this work. In addition to 3 regular meetings of the committee during the year, and many other meetings of subcommittees assigned special work, oil company laboratories and research staffs carry on cooperative tests to determine how closely the results of proposed new test methods will be in agreement.

Test Method Carefully Prepared

Many steps are taken in the preparation of A.S.T.M. standard testing methods to protect the interests of manufacturers and users alike from arbitrary methods which might unfairly discriminate against any products. New methods, before being officially proposed, are tried out in the laboratories of Committee D-2 members. The test method under consideration is run on the same oils, but in several different laboratories.

When new test methods are officially proposed, or material revisions in existing methods are made, they are frequently recommended by the Society to be published first "as information". As the next step the Society may approve them as tentative standard. They become formal standards only after they have been generally accepted by both manufacturers and users for some time, without important changes being proposed.

Following is a review of the new methods, and revisions, for petroleum products, as contained in the official report of Committee D-2 to the A.S.T.M., and approved by the Society at its annual meeting.

New Methods of Test Accepted by A.S.T.M.

Test for Rust-Preventing Characteristics of Steam Turbine Oils in the Presence of Water: Presented by Technical Committee C on Turbine Oils of Committee D-2. Chairman, F. C. Linn, General Electric Co.

This test was approved as tentative standard by the A.S.T.M. at the 1942 meeting. It will carry the serial number D 665-42 T.

Test procedure involves contact of a strip of steel of a specified composition, polished in a specified manner, with a stirred mixture of oil with a small amount of water, at temperatures approximating service conditions, for 48 hours. The oil is reported as passing the test if visual inspection of the steel specimen from duplicate tests shows no rusting. (See pg. R-216 for detail of test method).

Significance: The test is intended to indicate the ability of steam turbine oils, including those used for steam-turbine gears, to aid in preventing rusting of ferrous parts should water become admixed with the oil.

* * *

Test for Oxidation Characteristic of Heavy-Duty Crankcase Oils: By Technical Committee B on Lubricants. Chairman, H. C. Mougey, General Motors Corp. Approved for publication as information only, comment of interested parties is solicited by the Society. (The detailed test procedure will soon be issued by the A.S.T.M.)

This test is the result of work done the last few years by a special group of lubrication and automotive engineers, to standardize a laboratory engine test for evaluating for oxidation resistance crankcase oils designed for heavy-duty service conditions, and to shorten the test period. The method calls for the use of a Chevrolet engine with suitable loading and accessory equipment, the test period being 36 hours.

The oils are to be rated with respect to varnish and sludge deposits on the following parts: Varnish deposits—piston skirts, cylinder walls, rocker-arm cover, push-rod cover plate, crankcase oil pan; Sludge deposits—rocker-arm assembly, rocker-arm cover, push-rod cover plate, oil screen, crankcase oil pan. Ratings are on a scale from 10 to 0. A rating of 10 is assigned to parts free of deposits, a rating of 0 to parts on which deposits have reached a maximum or actually caused engine failure.

In addition, the oils are to be examined by the following standard methods of laboratory test for: neutralization number, naphtha-insoluble matter, chloroform-soluble matter, Conradson carbon residue, ash, viscosity, Saybolt Universal.

With regard to the significance and scope of this proposed new standard test, the report of Committee D-2 states:

"This method is intended for use in de-

termining the oxidation characteristics of engine crankcase oils designed for use under heavy-duty service conditions.

"In this method of test a crankcase lubricant is evaluated only in respect to stability or resistance to oxidation and the deposition of intrinsic contaminants resulting from decomposition, oxidation, or other changes which result in the lubricant in service.

"Other characteristics essential in a lubricant intended for heavy-duty service, such as freedom from the tendency to cause ring-sticking, valve-sticking, or combustion-chamber deposits, are not evaluated by this test method. The ability of the crankcase lubricant to peptize or hold in suspension extrinsic contaminants is not determined in this engine oxidation test. The so-called "detergent" characteristics of a lubricant, which must be considered in connection with lubricants intended for use in compression-ignition engines, are not evaluated by this method of test."

* * *

Test for Oil Content of Paraffin Wax: By Subcommittee 3 on Paraffin Wax. Chairman, L. C. Beard, Jr., Socony-Vacuum Oil Co., Inc. Published for information only. Comment of interested parties sought.

This method of test is intended for the determination of the percentage of oil in paraffin wax having a melting point of 105 deg. F. or higher and containing not more than 10% by weight of oil.

The method involves dissolving the wax in methylethylketone, cooling to minus 25 deg. F. to precipitate the wax, filtering out the methylethylketone containing the dissolved oil and determining the oil content of the filtrate by evaporating the methylethylketone and weighing the residue. Co-operative tests showed small deviation in duplicate results expressed as percentage of oil in the wax.

Significance: Methods for determining the oil content of waxes find use in the control of the various steps in the separation of oil and wax, as well as in the evaluation of waxes for various uses. The Society some years ago had a standard method but it was dropped because it was unsatisfactory.

* * *

Test for Color of Lubricating Oil by Means of Photoelectric Colorimeter: By Subcommittee 6 on Color. Chairman, H. M. Hancock, Atlantic Refining Co. Published for information only. Comment of interested parties asked.

Permits the use of a photoelectric colorimeter (consisting essentially of a stable source of illumination, standard sample holder, light filter and photoelectric cell) meeting the prescribed requirements. The method specifies an instrument which may be standardized by means of 6 aqueous solutions; thus insuring reproducibility. Since only a meter scale is read, the results are independent of the color sense and judgment of the operator. The method provides a continuous scale for obtaining the color of all lubricating oils, the color of which can be determined by the A.S.T.M. Union Colorimeter method.

Significance: Importance of this test method is emphasized by uncertainty of the future supply of satisfactory Union Colorimeter glass color standards. The apparatus may also be used to obtain additional information concerning the spectral distribution of the sample and other data.

* * *

Test for Potential Gum in Aviation Gasoline: By Technical Committee A on Gasoline. Chairman, C. B. Veal, Society of Automotive Engineers. First presented to the Society by this committee in 1941, it was recommended to be published again, with minor revisions, as information.

This method describes a procedure for an accelerated oxidation stability test for aviation gasoline, by means of which the quantity of residue (gum plus lead deposit) is measured after the gasoline has been oxidized for a specified time under prescribed conditions. Provision is made for a correction in the case of aviation gasoline containing tetraethyl lead. This is not the same method of test as is being used by the U. S. Army.

Test Methods Adopted As Tentative Standard

Test for Neutralization Number of Petroleum Products by Color-Indicator Titration: By Subcommittee 13 on Neutralization Number and Saponification. Chairman, H. P. Ferguson, Standard Oil Co. of Ohio. Adopted as tentative standard of the method as published in 1941 for information, with minor revisions.

Test for Neutralization Number of Petroleum Products by Electrometric Titration: By Subcommittee 13 on Neutralization Number and Saponification. Chairman, H. P. Ferguson, Standard Oil Co. of Ohio. Adopted as tentative standard of the method as published in 1941 for information, with minor revisions.

The above two tests are the result of a number of years of study of the variable factors affecting the results obtained in the determination of neutralization number, in which it was shown that temperature, time, degree of agitation, strength and type of solvent and strength of alkali affect the level and reproducibility of results, making advisable two test methods in place of the former D188-41T method, adopted by the Society in 1925. The committee presented the two methods in 1941, the so-called Rapid Method (by Color Indicator Titration) being a modification of the former D188-41T method, with the time factor shortened.

"In the case of new oils and slightly oxidized oils, the results are comparable," stated the committee's report on the two new methods. "However, in the case of severely oxidized oils, the results obtained by the colorimetric method are usually lower, both methods simply serving to indicate the rate of change of oxidation. The potentiometric method (Electrometric Titration) is to be preferred in the case of those oils which form stable emulsions or color the alcohol layer excessively."

Revision of Tentative Standard Tests

Test for Gum Stability of Gasoline (D525-41T): By Technical Committee A on Gasoline. Chairman, C. B. Veal, Society of Automotive Engineers.

Title changed to read "oxidation" instead of "gum". Other revisions minor.

Test for Kinematic Viscosity (D445-39T): By Subcommittee 5 on Viscosity. Chairman, J. C. Geniesse, Atlantic Refining Co.

Principal revision is a rearrangement of the capillary tubes to specify large diameters under certain conditions.

Test for Knock Characteristics of Motor Fuels (D357-41T): By Technical Committee A on Gasoline. Chairman, C. B. Veal, Society of Automotive Engineers.

The revision of this method involves the addition of knock-intensity guide tables and editorial re-arrangement.

Test for Saponification Number (D94-41T): By Subcommittee on Neutralization Number and Saponification. Chairman, H. P. Ferguson, Standard Oil Co. of Ohio.

Revision includes a change in the title to read: "Saponification Number of Petroleum Products by Color-Indicator Titration". The statement of scope of the test method has been changed to read: "The method of test is intended for determining the amount of constituents in petroleum products that will easily saponify under the conditions of test.

"The method is applicable to new or used petroleum oils, including electrical insulating oils and mixtures of fats and mineral oils. It is not applicable to used internal-combustion-engine crankcase oils and used turbine oils, or to oils containing compounds of sulfur, phosphorus, the halogens, or other elements that consume acids or alkalies."

Based on co-operative tests conducted by the committee, the revision includes a statement on reproducibility of the method as applied to fats and fatty oils, as follows: "In the case of straight fats and fatty oils, the determination by different operators should agree within plus or minus 4.0 saponification numbers." Saponification number is defined as the "number of milligrams of potassium hydroxide which is consumed by one gram of oil under the conditions of the test as prescribed in this method." The method of test is unchanged.

Revision of Standards, Immediate Adoption

Standard Method of Test for Gum Content of Gasoline (D381-36): By Technical Committee A on Gasoline. Chairman, C.

B. Veal, Society of Automotive Engineers. Minor changes only.

Standard Method of Test for Flash Point by Means of the Pensky-Martens Closed Tester (D93-40): By Subcommittee 12 on Flash Point. Chairman, J. B. Terry, Standard Oil Co. of California.

Minor changes to facilitate cleaning the cup.

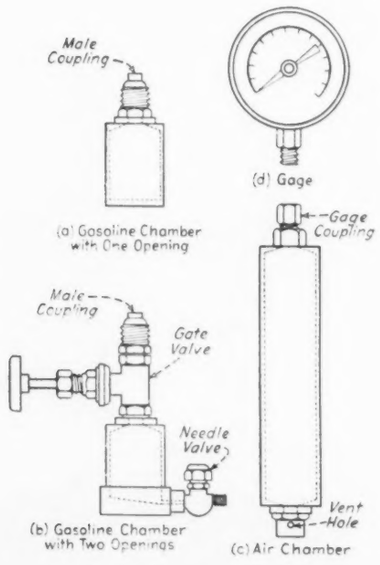
Standard Method of Test for Melting Point of Paraffin Wax (D87-37): By Subcommittee 3 on Paraffin Wax. Chairman, L. C. Beard, Jr., Socony-Vacuum Oil Co., Inc.

Revised to make the method applicable to the determination of melting point of waxes that do not give four consecutive 30-sec. readings within a range of 0.2 deg. F.

Standard Method of Test for Vapor Pressure of Petroleum Products (Reid Method) (D323-41): By Subcommittee 22 on Natural Gasoline. Chairman, G. G. Oberfell, Phillips Petroleum Co.

A change provides against the possibility of error when the air chamber and gasoline chamber are connected by amending Sect. 2(d) to read as follows:

"(d) Method of Coupling Air and Gasoline Chambers—Any method of coupling the air and gasoline chambers may be employed, provided that no gasoline is lost during the coupling operation, that no compression effect is caused by the act of coupling and that the assembly is free from leaks under the conditions of test. To avoid displacement of gasoline during assembly, it is desirable that the male fitting of a suitable coupling be on the gasoline chamber. To avoid compression of air during the assembly of a suitable screw coupling, a vent hole may be used to insure atmospheric pressure in the air chamber at the instant of sealing." (See accompanying figure of Vapor Pressure Bomb).



Vapor Pressure Bomb

Tentative Standards Adopted

Tentative Method of Test for Carbon Residue of Petroleum Products (Ramsbottom Carbon Residue) (D524-41T): By Subcommittee 23 on Carbon Residue. Chairman, L. C. Beard, Jr., Socony-Vacuum Oil Co., Inc.

Note—By emergency action, the use is approved, during the war, of a glass coking bulb, heat resistant and of the same dimensions, in place of a bulb made of stainless steel, as prescribed in the test method.

Tentative Method of Test for Tetraethyl Lead in Gasoline (D526-41T): By Technical Committee A on Gasoline. Chairman, C. B. Veal, Society of Automotive Engineers.

Tentative Standard Withdrawn

Tentative Method of Test for Neutralization Number of Petroleum Products and Lubricants (D188-41T) withdrawn on the recommendation of Subcommittee 13 on Neutralization Number and Saponification, H. P. Ferguson, Standard Oil Co. of Ohio, chairman, as it is superseded by the two new proposed tentative standard tests for neutralization number. (See above, Test Methods Adopted as Tentative Standard).

New A.S.T.M. Test for Rust-Preventing Characteristics of Turbine Oils

THE new test for rust-preventing characteristics of turbine oils approved as tentative standard by the American Society for Testing Materials at its 1942 annual meeting is the outcome of a portion of the work of the past two years of the Society's Technical Committee C on Turbine Oils.

It was recognized that the rusting behavior of turbine oils had become an important factor in their performance, and a section of the committee on rusting, under the chairmanship of William Kuebler, Westinghouse Electric & Mfg. Co., made a series of co-operative tests using the non-standardized tests which were in use at various laboratories on a series of new turbine oils.

These tests include (1) several variations of a procedure developed in the Westinghouse laboratory involving contact of a strip of steel with a stirred mixture of oil with a small amount of water and (2) a procedure in which the strip of steel is dipped alternately in the oil and water. It was concluded from these tests that the different procedures showed the same general trends and the stirring type of test was selected for further study. Results showed that rusting was more severe as the temperature of test was increased, and it was decided that temperatures approximating service conditions were preferable.

A second set of co-operative tests was run on oils on which a definite rating as to rusting tendencies was available, on the basis of plant performance. In these tests, the oils were rated in the same order by each laboratory, and the rating agreed with the service data but the absolute degree of rusting for a given oil varied considerably. It was felt that the variations were due to differences in technique, particularly in the preparation of the test strips of steel. A third series of tests, in which three modifications of the method of polishing the strip were used, showed the simplest and most practical polishing method gave the most consistent data. In this series, three oils of known service were tested and the results submitted by 10 laboratories. The oils were clearly classified in line with their service behavior by all the laboratories. The technique used in this series of tests is that the committee recommended to the Society for publication as the tentative method of test.

Another section of the A.S.T.M. committee on turbine oils, under the chairmanship of C. Dantsizen, General Electric Co., studied the oxidation of turbine oils. It has carried out one set of co-operative tests using a method which involved the long-continued oxidation of oil at 95 deg. C. in the presence of water and coils of iron and copper wire. Deterioration of the oil was determined by rise in neutralization number and also in diminution of interfacial tension toward water. Work is to be continued on this test, in the hope that a standard method can be later recommended to the Society.

In the work of a third section of the committee, in which oil systems of turbines are being studied, a questionnaire has been sent to turbine users to develop data on a number of points, among them: design of tanks, sumps and means for venting; effect of protective coatings on tanks and other parts of the turbine system to decelerate the oxidation of the oil; oil purification systems; cause and prevention of foaming of turbine oils. Information obtained in this questionnaire on temperatures and other factors in oil usage is now being assembled and correlated.

The official proposed method is as follows:

PROPOSED

Tentative Method of Test For RUST-PREVENTING CHARACTERISTICS OF STEAM-TURBINE OIL IN THE PRESENCE OF WATER[1]

D665-42T

Issued 1942[2]

This Tentative Standard of the American Society for Testing Materials is, under its

[1]Under the standardization procedure of the Society, this method is under the jurisdiction of the A.S.T.M. Committee D-2 on Petroleum Products and Lubricants.

[2]Accepted by the Society at annual meeting, June 1942.

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Catalytic Polymerization
Alkylation
Thermal Cracking
Thermal Polymerization
Thermal Reversion
JUIK Processes for Lubricating Oil Refining

Regulations, subject to annual revision. Suggestions for revision should be addressed to the Society, 260 S. Broad St., Philadelphai, Pa.

Scope

1. This method of test is intended to indicate the ability of steam-turbine oils, including those used for steam-turbine gears, to aid in preventing the rusting of ferrous parts should water become admixed with the oil.

Apparatus

2. The apparatus shall consist of the following:

(*a*) *Oil Bath*—A thermostatically controlled oil bath capable of maintaining a temperature in the oil sample of 140±2F. (60±1.1C). An oil having a viscosity of approximately 150 sec., Saybolt Universal, at 100 F. (37.8C.) is suitable for the bath.

(*b*) *Thermometer*—A low-range A.S.T.M. P.M. and Tag Thermometer (E1 (9F-39), graduated in either Fahrenheit or Centigrade degrees as specified, having a range of 20 to 230 F. or (—7 to +110C) and conforming to the requirements for this thermometer as prescribed in the Standard Specifications for A.S.T.M. thermometers (A.S.T.M. Designation: E 1) of the American Society for Testing Meterials[2].

(*c*) *Beaker*— A 400-ml., Benzelius type, tall-form, lipless glass beaker of heat-resistant glass[4].

(*d*) *Beaker Cover*—A flat glass beaker cover. An inverted glass Petri dish makes a suitable cover, as the sides of the dish aid in keeping it in position. Two holes shall be provided on any diameter of the cover: one, for a stirrer 8mm. (0.31 in.) in diameter with its center 6 mm. (0.24 in.) from the center of the cover, and the other, for the steel specimen (Paragraph g), 144 mm. (0.55 in.) in diameter with its center 16 mm. (0.63 in.) from the center of the cover. In addition, a third hole shall be provided for a thermometer 8 mm. (0.31 in.) in diameter, with its center 16 mm. (0.63 in.) from the center of the cover and on a diameter of the cover at right angles to the diameter through the other two holes.

(*e*) *Stirrer*—A stirrer constructed from stainless steel (Note 1) in the form of an inverted T. A flat blade; 25 by 6 by 0.6 mm. (1 by 0.24 by 0.24 in.) shall be welded to a 6 mm. (0.24 in.) rod in such a way that the blade is symmetrical with the rod and has its flat surface in the vertical plane.

Note 1—A suitable material is an 18 percent chromium, 8 percent nickel alloy steel conforming to grade S, type 304 of the Standard Specifications for Corrosion-Resisting Chromium-Nickel Steel Sheet, Strip, and Plate for Fusion-Welded Unfired Pressure Vessels (A.S.T.M. Designation: A 240) of the American Society for Testing Materials;[3] or S. A. E. Nos. 30905 or 30915[6].

(*f*) *Stirring Apparatus*—Any convenient form of stirring apparatus capable of maintaining a speed of 750±20 rpm.

(*g*) *Steel Specimen*—A steel specimen 12.7 mm. (0.5 in.) in width, 3 mm. (0.12 in.) in thickness, and approximately 121 mm. (4.8 in.) in length, made from steel conforming to grade 2 of the Standard Specifications for Cold-Rolled Strip Steel (A.S.T.M. Designation: A 109) of the American Society for Testing Materials[7].

(*h*) *Polishing Equipment.*—No. 1 emery cloth, No. 2/0 100 Waterproof Garnet Paper, Carborundum brand, a suitable jig for holding the steel specimen (the jig must not cover any part of the face of the specimen), and a faceplate with means for rotating at a peripheral speed of 2000 to 4000 ft. per min. (1000 to 2000 cm. per sec.). The emery cloth shall be attached to the faceplate by any suitable means.

Note 2—The faceplate may be mounted on the shaft of a fractional horsepower motor, on a jack shaft, or in the chuck of a lathe.

Preparation of the Steel Specimen

3. (*a*) The steel specimen (Section 2 (g)), either new or from a previous test, shall be prepared in accordance with Paragraph (b) and (c).

(*b*) *Preliminary Preparation.*—Clean the steel specimen with A.S.T.M. precipitation naphtha[5] or with hexane. Polish with the emery cloth to remove all irregularities, pits, and scratches as determined by visual inspection. In case the specimen has been used previously and exhibits no irregularities, it shall be polished with the emery cloth until no scratches parallel to the edge of the specimen remain. The specimen shall be held against the emery cloth near the periphery of the faceplate with the aid of the jig for the major part of the operation. When polishing the edges and ends, the specimen shall be held in the hands, using a clean cloth to prevent direct contact with the hands (Note). Store the specimens in hexane after this preliminary polishing until they are needed.

Note.—After cleaning with naphtha or hexane, the steel specimen shall not be touched with the hands until the test is completed. Forceps or a clean, lintless cloth may be used.

(*c*) *Final Polishing.*—Just before the test is to be made, remove the steel specimen from the hexane and dry with a clean cloth. Place the specimen in the jig and move by hand forward and backward, parallel to the longest dimension of the face or edge being polished, against No. 2/0 100 Garnet Paper laid on a flat surface. Continue this movement until all circular scratches have been removed and all visible scratches are parallel and longitudinal. Carry out the final stage of the polishing with new paper. Finally remove any burrs on the edges and corners by several strokes on the paper. Then wipe the specimen lightly with a clean, dry, lintless cloth and immediately immerse in the hot oil sample (Section 4 (*a*)).

Procedure

4. (*a*) Clean the beaker with chromic acid cleaning solution, wash with distilled water to remove the acid completely, and dry in an oven. Pour 300 ml. of the oil to be tested into the beaker and place the beaker in the oil bath held at a temperature that will maintain 140±2F. (60±1.1 C) in the oil sample. Cover the beaker with the beaker cover with the stirrer in position in the proper opening. Adjust the stirrer so that the shaft is 6 mm. (0.24 in.) off center of the beaker containing the oil sample and the blade is within 3 mm. (0.12 in.) of the bottom of the beaker. Then insert the thermometer through the proper hole in the cover so that it is immersed to a depth of 57 mm (2.2 in.).

Start the stirrer, and when the thermometer reading reaches 140±2F., 60±1.1C) remove the thermometer and insert the steel specimen prepared in accordance with Sect. 3.

(*b*) Suspend the steel specimen from the beaker cover in any suitable fashion, such as by a clamp, or a pin through a hole in the specimen, so that the lower end of the specimen is within 3 mm. (0.12 in.) of the bottom of the beaker.

Adjust the position of the specimen so that it will make angles of 45 and 135 deg. to the diameter of the cover passing through the centers of the two openings, the larger angle on the side of the cover toward the stirrer to be on the left if the stirrer rotates clockwise, and on the right if the stirrer rotates counterclockwise.

(*c*) Continue stirring for 30 min. to insure complete wetting of the steel specimen, then carefully add 30 ml. of distilled water down the side of the beaker farthest from the specimen and continue stirring at a speed of 750 ± 20 rpm for 48 hr. from the time water was added, maintaining the temperature of the oil-water mixture at 140 ± 2F (60± 1.1C). Stop stirring at the end of the 48 hour period, remove the specimen, allow to drain, and then wash with A.S.T.M. precipitation naphtha[5], or hexane. If desired, the specimen may be preserved by lacquering.

Report

5. (*a*) If visual inspection of the steel specimens from duplicate tests shows no rusting, the oil shall be reported as passing the test.

(*b*) If both specimens from duplicate tests show rusting, the oil shall be reported as not passing the test.

(*c*) If any rust spots or rust streaks are found on one specimen but not on the other, tests on two additional specimens shall be made. If either of these latter specimens shows rusting, the oil shall be reported as not passing the test. If neither of these latter specimens shows rusting, the oil shall be reported as passing the test.

Note.—In reporting rusting, the extent may be indicated as light, moderate, or severe, depending upon whether there are only a few rust spots, whether about half the surface is rusted, or approximately all the surface is covered with rust, respectively.

[2]1939 Book of A. S. T. M. Standards, Parts II and III.

[4]Pyrex glass or the equivalent is satisfactory for this purpose.

[5]1941 Supplement to Book of A.S.T.M. Standards, Part I, p. 64.

[6]1942 S. A. E. Handbook, p. 308.

[7]1939 Book of A.S.T.M. Standards, Part I, p. 83.

[5]The requirements for precipitation naphtha are given in Section 4 of the Standard Method of Test for Precipitation Number of Lubricating Oils (A.S.T.M. Designation: D 91) of the American Society for Testing Materials, 1940 Supplement to Book of A.S.T.M. Standards, Part III, p. 72.

60 Oil Company Technologists Active in Committee D-2 Work

COMMITTEE D-2 on Petroleum Products and Lubricants of the American Society for Testing Materials is an exceedingly active organization throughout the year in its official capacity of developing and improving standard methods of test specifications for petroleum products. However, through years of association in this work of leading technologists with oil companies and other concerns and scientific institutions, there have grown up around "D-2" a few social customs that set it apart from many technical groups.

The committee has a list of honorary members; men who have distinguished themselves by their earlier activity in the standardization work. One new honorary member was elected at the meeting of the committee in connection with the annual meeting of the A.S.T.M. in Atlantic City in June—John A. Oriel of the Asiatic Petroleum Co. The other 7 honorary members of "D-2" are S. J. M. Auld, Vacuum Oil Co.; F. R. Baxter, retired, formerly with Socony-Vacuum Oil Co.; A. E. Dunstan, Anglo-Iranian Oil Co. Ltd., of England; F. H. Garner, Esso European Laboratory; Walter Miller, vice-president, Continental Oil Co.; C. P. Van Gundy, Baltimore & Ohio Railroad; Robert E. Wilson, president, Pan American Petroleum & Transport Co.

It is also the custom of the committee to choose one of its members to honor at a dinner held during the annual meeting. Guest of honor this year was L. C. Beard, Jr., Socony-Vacuum Oil Co., Inc., who served last year as chairman of 5 subcommittees. J. B. Rather, also of Socony-Vacuum, was toastmaster, and the testimonial speech, which includes considerable ribbing, was by C. M. Larson, Sinclair Refining Co.

T. A. Boyd, General Motors Corp. research laboratories, re-elected chairman of Committee D-2

Tests Standardized

During Dr. Beard's association with the A.S.T.M., subcommittees or sections of which he is chairman have standardized or published methods of test for acid heat of gasoline, Ramsbottom carbon residue, and oil content of paraffin wax. The method of test for cloud and pour point was revised to make it adaptable to oils containing pour point depressants. Changes have been made in other methods to keep them up to date and in conformity with current needs.

Dr. Beard was a research chemist with Standard Oil Co. of New York from 1923 to 1932 and since with Socony-Vacuum. He has been a member of Committee D-2 since 1928.

Officers of "D-2" were re-elected at the recent meeting. Chairman is T. A. Boyd, head of the fuel department, General Motors Research Laboratories Division. Vice-chairman is T. G. Delbridge, manager of the research and development department, Atlantic Refining Co. Secretary is R. P. Anderson, secretary of the Division of Refining, American Petroleum Institute.

Two were elected members of the "D-2" advisory committee: A. E. Flowers, De Laval Separator Co., and C. A. Neusbaum, Standard Oil Development Co. Others on the advisory committee are: L. C. Beard, Jr.; L. L. Davis, Continental Oil Co.; G. G. Oberfell, Phillips Petroleum Co.; and C. B. Veal, Society of Automotive Engineers.

The regulations of the A.S.T.M. governing standing committees provide for 38 producer (oil company) voting memberships, 29 consumer and 12 general interest (technical schools, scientific associations, government bureaus and others). In all, however, about 60 oil company technologists take part in the work of Committee D-2. The list of oil company representatives is as follows:

Representatives Listed

Alden, R. C., Phillips Petroleum Co.
Ayers, Eugene, Gulf Research and Development Co.

Beard, L. C., Socony-Vacuum Oil Co.
Becker, A. E., Standard Oil Development Co.
Bennett, H. T., Mid-Continent Petroleum Corp.
Bevin, Sydney, Fiske Brothers Refining Co.
Beyer, V. F., Stanco, Inc.
Bowles, J. T. B., Crown Central Petroleum Corp.
Breth, F. W., L. Sonneborn Sons, Inc.
Burroughs, L. C., Shell Oil Co., Inc.

Camp, H. W., Cities Service Oil Co.
Chittick, M. B., Pure Oil Co.
Clayden, A. L., Sun Oil Co.

Davis, L. L., Continental Oil Co.
Dean, E. W., Standard Oil Development Co.
Dean, J. C., Socony-Vacuum Oil Co., Inc.
DeGray, R. J., Socony-Vacuum Oil Co. Inc.
Delbridge, T. G., Atlantic Refining Co.
Detwiler, J. G., The Texas Co.

Edlund, K. R., Shell Oil Co., Inc.

Farogher, W. F., Catalytic Development Co.
Ferguson, H. P., Standard Oil of Ohio.
Frichot, B. C., Deep Rock Oil Corp.

Geniesse, J. C., Atlantic Refining Co.
Georgi, C. W., Quaker State Oil Refining Corp.
Goulston, Bernard, Imperial Oil, Ltd.
Griswold, J. W., Cities Service Oil Co.

Hancock, H. M., Atlantic Refining Co.
Harrington, J. R., The Texas Co.
Haskell, Raymond, The Texas Co.
Hill, J. Bennett, Sun Oil Co.
Holaday, W. M., Socony-Vacuum Oil Co., Inc.

Klein, J. M., American Oil Co.
Krestan, J. H., Swan-Finch Oil Corp.

Larson, C. M., Sinclair Refining Co.
Lowry, C. D., Jr., Universal Oil Products Co.

MacGregor, J. R., Standard Oil Co. of California.
Mackenzie, K. G., The Texas Co.
Marshall, A. G., Shell Oil Co., Inc.
Matthews, Ralph R., Battenfeld Grease & Oil Corp.
McConnell, E. B., Standard Oil of Ohio.
McCoy, J. T., Tide Water Associated Oil Co.
Miller, A. E., Sinclair Refining Co.
Mittleman, L., Tide Water Associated Oil Co.
Moore, C. C., Jr., Union Oil Co. of California.

Neely, G. L., Standard Oil Co. of California.
Neusbaum, C. A., Standard Oil Development Co.

Oberfell, G. G., Phillips Petroleum Co.
Oldacre, W. H., D. A. Stuart & Co.

Parsons, L. W., Tide Water Associated Oil Co.
Pfarr, J. S., Ashland Oil & Refining Co.
Phillips, E. B., Sinclair Refining Co.

Ramey, C. F., Standard Oil Co. of California.
Rather, Dr. J. B., Socony-Vacuum Oil Co.
Rogers, T. H., Standard Oil Co. of Indiana.
Rosenstiehl, F. E., The Texas Co.
Ross, W. B., Pure Oil Co.

Skiolvig, Age, Shell Union Oil Corp.
Smith, H. G., Gulf Oil Corp.

Terry, J. B., Standard Oil Co. of California.
Tuemmler, F. D., Shell Development Co.
Tucker, E. B., Standard Oil Co. (Indiana)

Vogel, R. E., Standard Oil Co. of Indiana.

T. D. Delbridge, manager of research and development department, Atlantic Refining Co., re-elected vice-chairman of Committee D-2

L. C. Beard Jr., Socony-Vacuum Oil Co., Inc., guest of honor at the 1942 Annual Dinner of Committee D-2

Petro-Chemicals

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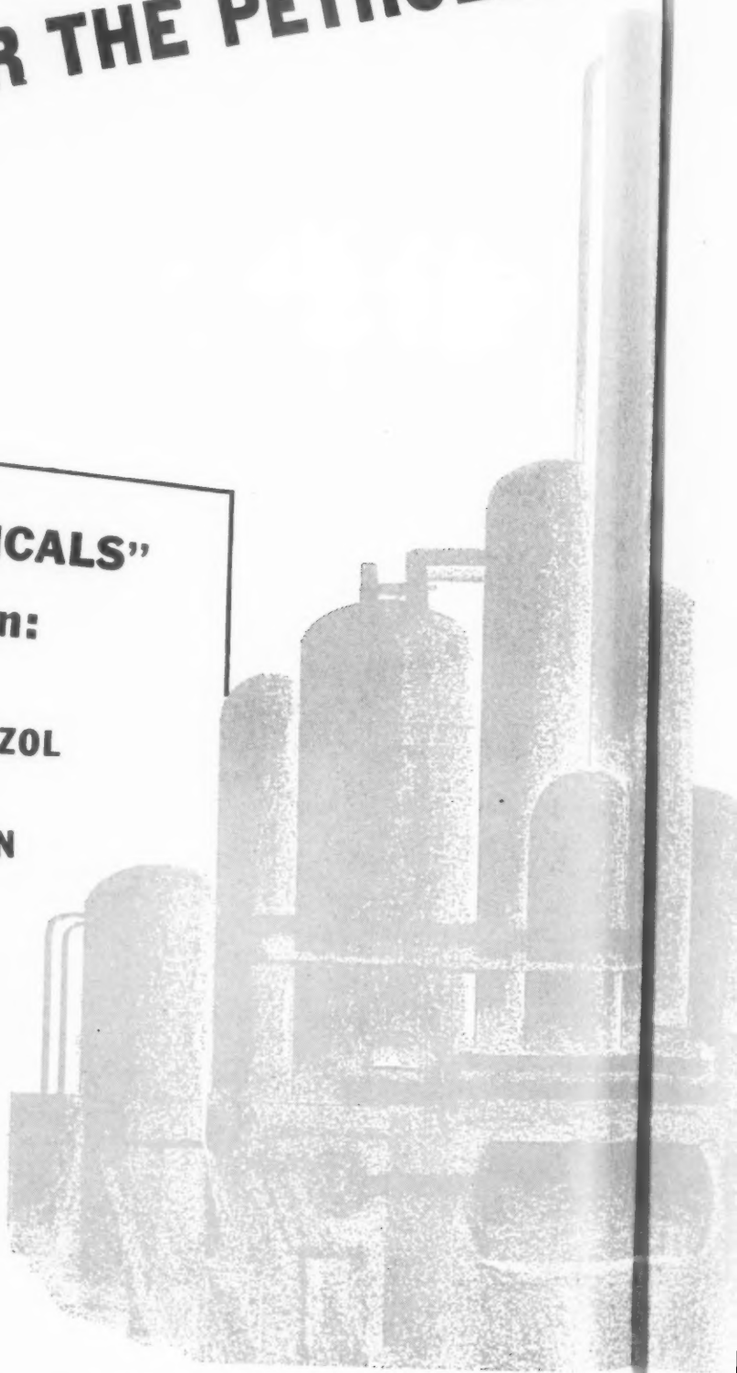

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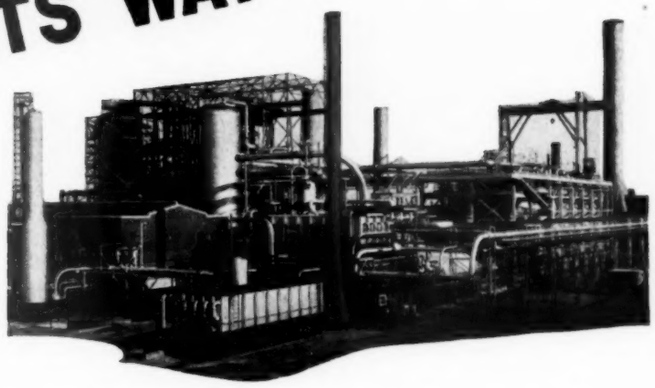

The role of the refinery in this new era of "petro-chemicals" is now fairly well defined. It can look forward to:

1 . . . making raw chemicals or intermediates for other industries to use as processing agents; or

2 . . . making finished chemicals for the general public or for industrial use.

No straight line can be drawn showing where each refinery's interest ends and that of another processing plant begins. But one thing is sure. The chemicals now being produced from petroleum are prophetic of the opportunities lying ahead for the petroleum industry.

The Badger Company is exceptionally qualified to serve the industry on petro-chemical projects. It is strongly staffed with engineers and constructors who have had years of experience in the design and construction of chemical as well as petroleum plants and equipment.

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Edgar Discusses Post-War 'Gas'

"The tremendous demand for high-octane aviation gasoline, together with the program for synthetic rubber, has brought about the erection of greatly increased catalytic cracking capacity, and this capacity undoubtedly can and will be used after the war to produce motor gasoline of high anti-knock quality."

So said Dr. Graham Edgar, director of research, Ethyl Gasoline Corp., in his address "Gasoline—Past, Present and Future", given at the 17th annual Edgar Marburg Lecture before the American Society for Testing Materials at its 1942 meeting.

Although he stated that predictions concerning post-war gasoline must be made with very considerable reservations, Dr. Edgar said that "what post-war gasoline *could be* is by this time fairly well established". He said that the premium gasoline of 1941, approximately 80 octane, could be produced as a housebrand gasoline, while the premium grade could have an effective anti-knock value between 90 and 100 octane.

Car Changes Predicted

He propounded the question: "Will such gasoline be produced and marketed?" and answered it by stating this depends largely upon the automotive engineer. In the automobile of the future, he said, radical changes can be expected in body design, but that answers to the question of what the post-war engine will be—whether or not it will be an engine of extremely high compression and high thermal efficiency, or a small supercharged engine capable of producing the necessary power but saving in weight and size, or an engine embodying principles quite different from the conventional engine of today—depends on the petroleum industry and the fuels it supplies, as well as upon the automotive engineers. As has been true in the past, both industries must continue to advance together, the speaker declared.

A.S.T.M. 'Gas' Tests Discussed

The first part of Dr. Edgar's address dealt with the history of gasoline. Then followed a scholarly discussion of the A.S.T.M. tests for gasoline, their uses and practical value, giving detailed consideration to the tests for volatility (distillation and vapor pressure) and those relating to knocking tendency, together with a brief treatment, because of military secrecy, of the present developments in aviation gasoline.

The purpose of the A.S.T.M. Marburg Lecture is to have leaders in their respective fields describe outstanding developments in the promotion of knowledge of engineering materials. Thus A.S.T.M. has emphasized the importance of promoting knowledge of materials, and honors and perpetuates the memory of Edgar Marburg, its first secretary.

In accordance with the usual practice of the Society, Dr. Edgar's complete lecture will be published in special pamphlet form and copies can be obtained at a nominal charge from the A.S.T.M. headquarters in Philadelphia.

Elected to Executive Committee of A.S.T.M.

R. P. Anderson, secretary of Committee D-2, elected a member of the executive committee of the American Society for Testing Materials

Dr. R. P. Anderson, secretary of the Division of Refining of the American Petroleum Institute, was elected a member of the executive committee of the American Society for Testing Materials at the annual meeting of the Society in June. Dr. T. G. Delbridge, manager of research and development, Atlantic Refining Co., who has been a member of the Society's executive committee for several years and was its president in 1938-39, leaves the committee at this time.

Dr. Anderson was a technologist for the American Petroleum Institute from 1924 to 1931 and since has been secretary of its Refining division. He has been secretary of Committee D-2 since 1925 and serves on other committees of the Society and is active in the work of other technical associations.

Dudley Medal Awarded by A.S.T.M.

American Society for Testing Materials has awarded the Charles B. Dudley Medal to Dr. F. C. Todd, assistant professor of petroleum and gas engineering, and Dr. A. W. Gauger, director of mineral industries research, both of Pennsylvania State College, for their technical paper describing in detail extensive studies on measurement of water vapor and gases. The paper was presented at the 1941 A.S.T.M. annual meeting.

Paper describes authors' extended work in developing a precise laboratory and field method for estimating moisture in fuel gases, depending, respectively, on light absorption by water vapor at a particular wavelength in the near infra-red and color change of cobaltous bromide in an organic solvent on addition of water.

Synthetic, Natural Rubber Compounds Classified

A system of classifications covering 57 synthetic and 40 natural rubber compounds has been worked out by a joint committee of the Society of Automotive Engineers and the American Society for Testing Materials. It is designed both to conserve rubber by enabling manufacturers to select those compounds whose properties and characteristics are known to meet the requirements of specific uses, and also to make effective use of alternate compounds. The classifications are to be recommended to the War Production Board for promulgating in the war conservation program.

Consists of 3 Groups

The classifications are in 3 groups; "A" for general purpose compounds, "B" for compounds meeting maximum compression set requirements, "C" for compounds adapted to outdoor aging. Synthetic rubbers are identified by the letter "S" preceding the group classification. "A" group includes 3 types of Thiokol; "B" covers Chemigum, Hycar OR, Perbunan and one type each of Thiokol and Neoprene; "C" includes 4 types of Neoprene.

Numerals indicate the range of ASTM hardness as measured by the Shore durometer and original tensile strength. Additional data indicate measurement of elongation and of compression set; changes in tensile strength, elongation and hardness after over-baking; and changes in tensile strength, durometer and volume after oil aging.

Natural Denoted by 'R'

Natural rubber classifications are denoted by the letter "R". Numerals indicate durometer and minimum tensile strength. Additional data show minimum elongation, 20% load deflection and compression set.

Mellon Fellowship Established For Chemical Storage Study

A multiple fellowship on chemical containers and storage has been established at Mellon Institute of Industrial Research by Pittsburgh-Des Moines Steel Co. The Chemical Storage Fellowship will further work on all bulk-chemical storage problems in industry, with special current emphasis on hydrocarbons such as petroleum, gasoline and natural gas and the basic chemicals of the synthetic rubber industry, including butadiene, styrene, acrylonitrile and iso-butylene.

The research work will lead to recommendations as to most suitable types of containers, most appropriate materials of construction, and proper temperatures and pressures for storage of liquid and gaseous commodities; also charts indicating most economical storage conditions for various annual turnovers.

Senior incumbent of the fellowship is Dr. James B. Garner, a chemical engineer known professionally for his achievement in hydrocarbon chemistry and technology. He is aided by Ludwig Adams, a specialist in engineering materials and welding, and R. M. Stuchell, a research metallurgist.

Aircraft Lubricating Oils for the War Effort

094.7

Official Photo—U. S. Navy

By C. M. Larson*

(Presented before joint meetings of the Department of Manufacture and of Standards and Tests, National Petroleum Assn., Bradford, Pa., June 2, and Oil City, June 3, 1942)

Characteristics of lubricating oils for aircraft to meet wartime conditions, as contrasted with the former standards required in airline service, are discussed by the consultant to the government on this subject. The requirements of additives in aircraft oils are also presented. The extent to which the war demand for aircraft oils must be supplied by the refiners of Pennsylvania crude is brought out.

SINCE the Pearl Harbor episode, the need for adequate supplies of aircraft lubricating oils has focused attention on the Pennsylvania manufacture because this source of high, inherent quality has been the "backbone" of heavy grades of lubricating oils for aircraft engines.

Even though considerable advance has been made in refining processes for the oil refiner to be less dependent upon the character and the nature of his raw materials, the requirements of the modern war aircraft engines make it difficult to divert very far from the Pennsylvania standard make of aircraft lubricating oil. Besides, the manufacture from other crude oil sources is hampered by the scarcity of critical additive materials to correct the mineral oil deficiencies. Then, too, an aircraft oil or an additive may originate in the laboratory and be subjected to many chemical and physical laboratory tests, but the final proof of its suitability relies on full-scale aircraft engine tests and extensive flight experiences extending over 700-hour overhaul inspection periods of aircraft engines.

War Demands

It is estimated that the present demands for aircraft lubricating oils are 4000 b/d and at the end of the year this will be increased to 7000 b/d. By the end of 1943 the requirement will call for 13,000 b/d.

If the 250,000 b/d figure of 100-octane gasoline goal is taken as a base of future aircraft lubricating oil needs, and a factor of 20 fuel to 1 oil (based on England's ratio) then the ultimate is 12,500 bbls. However, there are other usages of aircraft oils where fuel ratios do not apply, so that the estimated 13,000 b/d of aircraft lubricating oils is the one to shoot at by the end of 1943.

Based on the "Navy-War Requirements", the U. S. Navy calls for 750 b/d (1080-1150) of aircraft oils; whereas, based on the U. S. Army Air Force bid, the Air Force rate is approximately 2000 b/d (1065A-1120) for the rest of the year.

This leaves the aircraft engine manufacturers (300), the airlines (200), the airplane manufacturers (500) and the Lend-Lease program (3000) to absorb the balance to reach a daily consumption of 7000 bbls. by the end of this year. It is estimated that the Pennsylvania refiners will be called upon to furnish at least 60% of the war requirement for aircraft lubricating oils.

The aircraft engine manufacturers each have specifications for aircraft lubricating oils. Pratt & Whitney Air-

*Chief Consulting Engineer, Sinclair Refining Co., New York; consultant for lubricants to Secretary of War; consultant to Office of Petroleum Co-ordinator on additives, manufacturing and allotment.

Dive bombers "peeling off". Douglas aircraft carrier type scout bombers. Official photograph U. S. Navy

craft is covered by Specification PWA 504 (aircraft engine lubricating oil, viscosity 100) dated June 11, 1937. It calls for 100± 5 seconds at 210 deg. F. with a 95 minimum V.I.; viscosity at 100 deg. F. not over 12.5 times viscosity at 210 deg. F.; pour of 10 deg. F. minimum and a carbon residue of 1.00 max. is required; flash, 475 minimum.

Due to the fact that Pratt and Whitney use silver bearings electroplated with lead (.003), the corrosive nature of the oil, more especially for aircraft engine "run-in" on the test stand of engine production, is of importance. For this, the "10 holer" corrosion tester, manufactured by Emil Greiner, New York, is used by Pratt and Whitney Aircraft to check aircraft lubricating oils.

The test specimens are controlled electroplated bushings run in the corrosion apparatus for 5 hours at 320 deg. F. Oils check from a low of .001 to a high of 1.33 grams weight loss. It is known that 1.20 grams show bad corrosion on "run-in".

The advantage of the "10 holer" is that reference and check tests on three other oils can be run at the same time. With the Underwood Corrosion test only one oil can be run. The Underwood test is more drastic than the Pratt and Whitney requirement.

For Wright Aeronautical Corp., specification Nos. 5815B and 5817B, dated July 10, 1939, and March 6, 1939, respectively, cover aircraft lubricating oil of the 120 grade. This calls for a viscosity at 210 deg. F. of 115-125 seconds. The viscosity at 100 deg. F. shall not be more than 14.5 times that at 210 deg. F. The pour should be 20 deg. F. max. and carbon residue is 1.5% max. There is also a flash point of 475 deg. F. min.

The main hurdle in passing the Wright Specification is to get Wright approval which requires full scale engine test ($1500), 14 bbls. of oil are needed for same. Here, the copper lead master rod bearing, which is lead flash coated, is to be considered from an oil corrosion standpoint.

The Army and Navy requirements are covered by Specification AN-VV-O-466, dated Dec. 15, 1941. The principal grades are the 100 viscosity at 210 deg. F. (1100A and 1100) and the 120 seconds viscosity at 210 deg. F. (1120).

The Army calls for a 100 V.I. minimum on the 100 grade (93/103 seconds viscosity at 210 deg. F.), known as 1100A; the Navy calls for 95 V.I. minimum on its 1100 grade with the same viscosity limits at 210 deg. F. The pour points of both 100 grades are +10 deg. F. max. with a carbon residue requirement of 1.2 max. and 470 deg. F. flash minimum. The 120 grade (115-125 seconds viscosity at 210 deg. F.) has a 95 minimum V.I. property, with 490 deg. F. flash minimum and +20 deg. F. maximum pour point requirement.

Work Factor Test Required

The Navy still calls for a work factor test (Bureau of Ships Bulletin N. B. S. 431 dated Feb. 1, 1942) and requires a minimum of .85 work factor minimum stability. As yet no corrosion test has been added, as the work factor machines are equipped with Babbitt bearings and there is no check for corrosion on these bearing machines.

However, work factor machines have been equipped with copper lead and other alloy bearings at Annapolis but for research purposes only. The Army Air Force at Wright Field is working on a single-cylinder engine (COT) test for aircraft lubricating oils. Ten of these engines have been ordered from Waukesha Engine Co. and by Jan. 1, 1943, some data should be available for correlation with war aircraft engines in flight.

The future Lend-Lease needs have been put on Navy work factor approved 1065 to 1150 aircraft oils, and trade branded and pool oil products are definitely out on such bids.

Airlines vs. Army-Navy

The service requirements of airlines are based on 600-750 hours between overhaul of aircraft engines and usually 100 hour drain periods are used. The war requirements have reduced engine overhauls from 100 to 300 hours where the life expectancy is not hampered by combat losses.

Thirty to 50-hour engine drain periods are used. This is reflected by the ratio of 50 gal. of aviation gasoline consumed to one gal. of aircraft oil used for airlines, as related to war usage of 20 gal. fuel to one gal. oil in the Army-Navy and United Nations aviation services.

The airlines have been concerned mostly with ring wear, piston lacquer and long cylinder barrel life. Ring wear causes blowby and cuts life of overhaul due to excessive oil consumption, whereas piston lacquer eventually scales off so that the edge type filters clog and engine oil pressures drop, sometimes causing forced landings.

Long cylinder barrel life is needed to keep maintenance costs down. Excessive crankpin deposits not only throw the carefully balanced crankshaft out of balance, but as the deposit level reaches the end of the tube, the foreign material normally centrifuged out is allowed to pass the master rod bearing where it promotes wear. This fact is important to those engines which depend solely on bearing clearances for controlling the flow of oil into the power section of the engine.

An analysis of a typical sample of this crankpin deposit is shown in table 1.

The lubrication problems of wartime usage of aircraft engines are stuck rings due to higher engine outputs. This results in overheating of top lands of pistons so thermal coking results. There is need for tougher lubricating films for towing targets or gliders, which service also creates higher temperatures of bearings, cylinders and pistons, because of the reduced cooling at higher outputs at reduced air speeds.

There is also a very dire need for a correction of the oil foaming phenomenon which has been current for a number of years and which jeopardizes the continuity of parts lubrication.

When this occurs in flight, oil foam is emitted from the engine breather or from the oil tank vents or cap with great rapidity and proceeds to cover the en-

Table 1—Analysis of Typical Sample of Crankpin Deposit

	Per Cent	Source
Soluble in ASTM Naphtha	8.01	Mineral oil present as such, from oil
Insoluble in ASTM Naphtha	.75	Gums and resins, from oil
Soluble in Chloroform	...	
Carbon and carbonaceous matter	2.97	From oil and fuel
Silica and siliceous matter	1.09	Sand and dust contamination
Lead as PbO	69.41	From fuel
Iron as Fe_2O_3	3.39	From wearing parts
Halides as bromine	15.6	From fuel
Specific gravity at 80° F.	4.159	
Weight in ounces	12.5	
Time since overhaul (hours)	538	

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★ **PETRECO SERVICE**—Petreco service engineers are available 24 hours a day in every locality where Petreco Desalters are in operation. It is their duty to inspect Petreco units, and keep them at top operating efficiency. There is no charge for this service to Petreco licensees, to whom the extensive Petreco research facilities and testing laboratories also are available, gratis.

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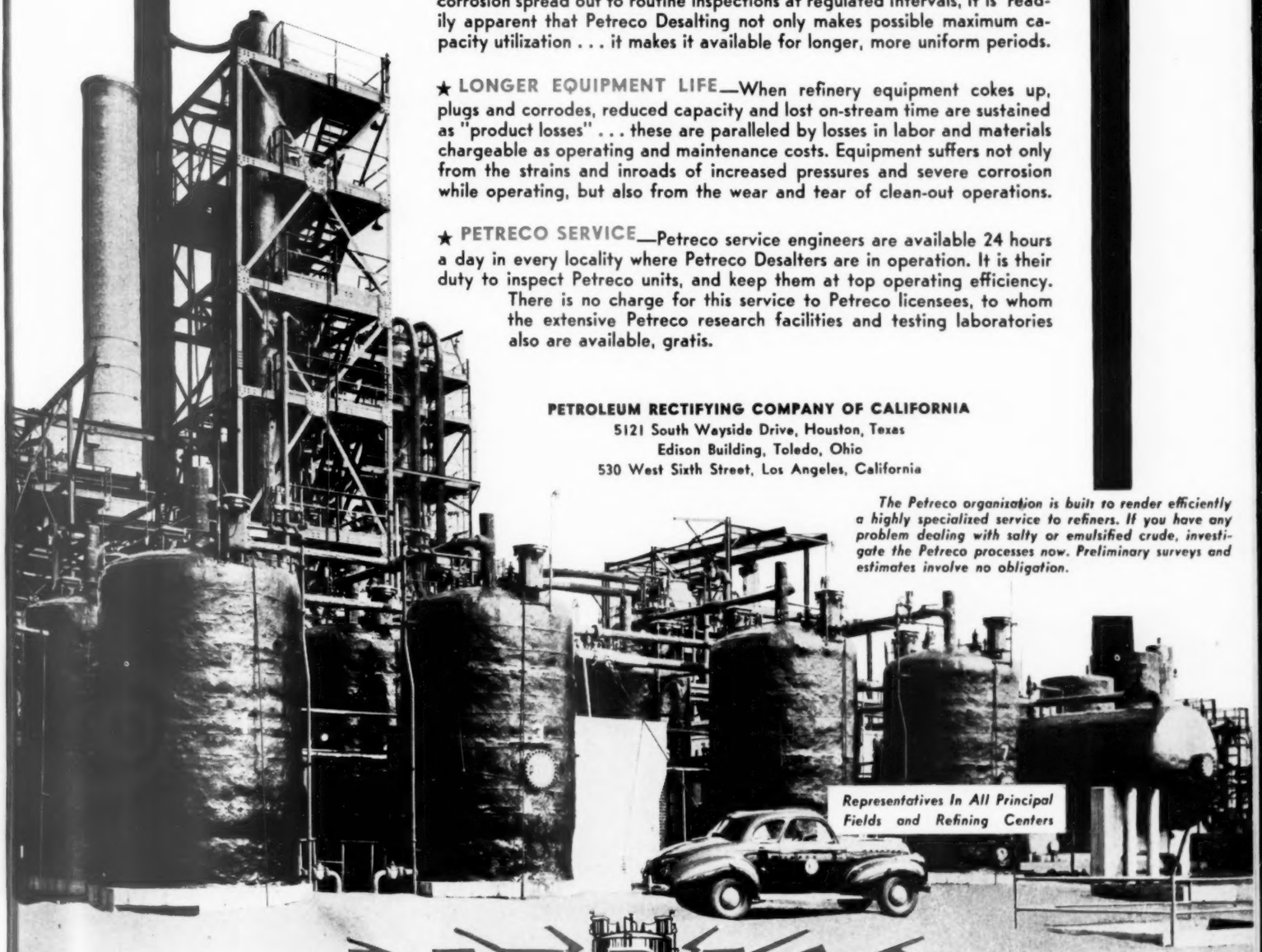

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DESALTING DEHYDRATING

gine nacelle and wing center section, as well as the side of the cabin including the windows. The passengers' reaction is even worse than if the engine had failed mechanically because there is more visible evidence present. This foaming seems to be tied up to minimum viscosities of the circulating system.

Manufacture of Aircraft Oils

The Pennsylvania aircraft oils are made from neutral and bright stock but, to get higher degrees of stability against oxidation, the stocks are solvent treated to the 1120 grade (AN-VV-O-446). It is possible to rerun the neutral over lye and this blended with bright stocks gives oils with higher Navy work factor values.

In order to analyze the Pennsylvania picture, if it is assumed that 10% of the crude is bright stock, then 8000 bbls. of bright stock can be made at the present average rates of Pennsylvania crude oil production. To blend up with 23 to 25% of Pennsylvania neutral to 100 viscosity at 210 deg. F. (Navy Symbol 1100 Oil) as required by the Navy and Pratt and Whitney, the yield would be better than 10,000 b/d.

However, if the 1120 oil (120 viscosity at 210 deg. F.) is manufactured, then the figure is cut 10 to 12%, or to 9000 b/d. But if the 8000 b/d of bright stock were double solvent treated to Navy Symbol 1120 grade with a .65 carbon residue, then this would be reduced to approximately 6200 b/d against the neutral and bright stock blends of 1120 grades of 9000 b/d from Pennsylvania crudes, or 10,000 bbls. for the 1100 neutral-bright stock blends.

The actual reports turned in by the Pennsylvania refiners, plus the other 95 V.I. minimum aircraft oils, show that 10,000 b/d are available and the production is 2 to 1 in the 99 to 150 secs. viscosity at 210 deg. F. against that made between 61 to 99 secs. viscosity at 210 deg. F. The neutrals would slightly swell these daily figures.

To get another slant at this Pennsylvania aircraft lubricating oil picture let's take the following manufacture of 1000 b/d and see how this is reduced through higher viscosity requirements or refinement to greater stability (see table 2).

Table 2—Reduction in Volume through Higher Viscosity Requirements Or Refinement to Greater Stability

BLEND	Vis. @ 210° F.	Carbon Residue	B/D
Neutral and Bright Stock	100 sec.	.90	1000
Neutral and Bright Stock	120 sec.	1.10	850
Double Solvent Treat Stock	120 sec.	.65	680
Dewaxing to 5-10° F.	120 sec.	.65	640

Dewaxing below +5 deg. F. pour point is prohibitive as it cuts deeply into the aircraft lubricating oil yields.

For lowering the pour points of aircraft oils, some 65 tons of chlorine are used to make pour depressants. Chlorine is classed as a critical material and dewaxing is necessary to where practical.

Solvent treated Mid-Continent aircraft oils are being offered, but unless the higher V.I. (80-85) bright stocks are used, the loss of yield approaches 35-40% to get 95 min. V.I. oils of 120 sec. at 210 deg. F. Of course, corrosion correction has to be resorted to to pass requirements of Pratt and Whitney and others. The higher volatility of such Mid-Continent solvent treated oils is said to cause cracking of the aircraft lubricating oil in service and the engine oil consumptions are slightly greater.

For one of the South American Republics a test is being run at Wright using a conventional treat of 82-85 V.I. Mid-Continent 120 sec. at 210 deg. F. aircraft oil, plus 3% of a suitable additive. This test, along with flight tests, may prove a way to ease the aircraft lubricating oil picture for some phases of aircraft engine service.

Viscosity

Table 3 shows the difference in cold starting properties based on a maximum allowable viscosity at low temperatures.

Since engines operating at 30,000 to 60,000 ft. know no difference in stabilized operating temperatures, the 1065A or 1065 oils are too light and the oil consumption would be excessive. Bearing failures might result and extended usage would show high barrel and piston ring wear.

Additives

The use of additives in the war effort has been reduced to a minimum. However, there are definite relations which are known to help visualize the chemical relationship to service requirements or results.

For the non-corrosion inhibitors, the natural sulfur left in the aircraft lubricating oil, namely 0.30%, is of utmost importance. Where solvent refining has reduced this amount, the sulfur additives can replace the natural sulfur corrosion inhibitors put in by nature.

There is a difference in sulfur corrosion inhibitors available. One type will give .36 grams weight loss by Pratt and Whitney method. Another will give .001 grams loss, the latter a perfect score. The new arsenic-lead bearing metal which is resistant to corrosion could correct this corrosion factor.

For oxidation inhibitions to check viscosity increases and lacquers caused by high asphaltenes, the phosphites and lecithins are the better types but these do not necessarily take care of the corrosion factor. The neutrals used are the weakest link so far as corrosion and lacquer deposits are concerned.

To add wetting or oiliness value to an aircraft lubricating oil, the ketones, phos-

Table 3—Difference in Cold Starting Properties, Based on Maximum Allowable Viscosity at Low Temperatures.

Aircraft Oil	Vis. @ 210°F.	V.I.	Cold Starting Minimum Temperatures Starting Temp. °F.
1120	120 sec.	95 min.	30
1100	100 sec.	95 min.	25
1100A	100 sec.	105 min.	20
1065A	65 sec.	105 min.	0

On the high temperature oil, for circulating temperatures the following are given for each

Navy Symbol Oil	Max. Safe Oil Circulating Temp.
1120	215° F.
1100	200° F.
1065	170° F.

Douglas B-18 H bomber (Official photograph U. S. Army Air Corps)

Enough to "keep 'em flying"

Despite the almost incredible increase in output of fighting and bombing aircraft that has taken place and the even more stupendous increases that are coming, the program for fueling the allied air offensive is keeping pace—KEITH FANSHIER in CHICAGO JOURNAL OF COMMERCE, June 13, 1942

It takes 100-octane gasoline to "fuel the allied air offensive"—and plenty of it

How much is being produced today is a military secret

But it is no secret what our flyers did to the Japanese ships in Coral Sea and Midway battles It is no secret what our own and allied air men are doing to the enemy on other fronts

There was enough 100-octane gasoline to make those achievements possible and there is plenty more coming from where that came from

Universal processes are making the constituents of 100-octane gasoline in ever growing volume—and those processes are available to all refiners, under license from Universal

OIL IS AMMUNITION—USE IT WISELY

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phates or sulfurized sperm oils are used. The last named has the added value of correcting scoring of liners or feathering of rings, but too long a use of the oils so compounded will give breakdown leading to pitting effects.

For V.I., the viscosity index improvers like Paratone are usable up to 1% without affecting stability but the more stable Paratone of Pennsylvania origin is hard to get.

As mentioned before, dewaxing below 25 deg. F. pour points is not used in all manufacture, or 65 tons of chlorine would not be needed to make pour depressants for aircraft lubricating oils had same been dewaxed to 5 deg. to 10 deg. F. pours.

Detergents have been tested by some of the airlines but these tests show that, while the engine is clean and ring sticking is eliminated, yet engine barrel and piston ring wear are much greater. Used oil analysis is no criterion for judging engine cleanliness or corrosion.

From an overall picture it appears that the Pennsylvania refiner has a natural, in that nature has put into this crude all the values most needed for aircraft lubricating oils—that of the correct viscosity—temperature relationship for easier starting and proper factor of safety at operating temperatures; low volatility to keep oil consumption low and cracking to a minimum; high oiliness and film strength for long life of cylinder and rings; proper sulfur content to inhibit corrosion; proper characteristics to give high stability against sludges and carbon formations; and, last but not least, a pedigree that specifications or V.I. cannot over-ride and only very tedious aircraft engine tests can evaluate. How clever these V.I. promoters were to displace Pennsylvania oil pedigree but you can't fool the aircraft engine. It is too clever for man and his V.I.'s.

Aircraft Lubricating Oil Specifications

	Pratt & Whitney Aircraft PWA 504	Wright Aero. Corporation No. 5815 B Grade 120	Army-Navy Aeronautical Specification AN-VV-O-446				Ranger Eng. Corp. No. 1005 Grade 120
			Army		Navy		
			1100A	1120	1100	1120	
Flash Min. Fire	475° F. Min.	475° F.	470	490	470	490	475° F.
Vis. at 210° F.	100± 5 Sec.	115-125	93-103	115-125	93-103	115-125	115-125
Vis. at 100° F.	Not over 12.5 x Vis. at 210° F.	Not over 14.5 x Vis. at 210° F.	—	—	—	—	14.5 x Vis. at 100° F.
Vis. Index (V.I.)	95 Min.	95 Min.	100 Min.	95 Min.	95 Min.	95 Min.	95
Pour Max.	10° F.	20° F.	10° F.	20° F.	10° F.	20° F.	20° F.
Carbon Residue	1.00% Max.	1.5% Max.	1.2 Max.	1.5 Max.	1.2 Max.	1.5 Max.	1.50
Neutral. No. Max.	.10	.10	.10	.10	.10	.10	.10
Max. Emulsion Test.	60' Max. using distilled water at 180° F.	60' Max. using distilled water at 180° F.	60' Max. at 180° F. with each: (1) distilled water (2) 1% NaCl				60' Max. using distilled water at 180° F.
Precipitation No.	None	None	0	0	0	0	None
Evaporation Loss	-	.5% Max.	-	-	-	-	.5% Max.
Sulphur Max.	-	-	.5	.5	.5	.5	-
Ash	-	.01% Max.	0	0	0	0	.01% Max.
Stability Test.	For run-in Corrosion Test.	Approval Engine Test.	Copper Strip at 212° F. Work Factor .85 Min.				Approval Engine Test.
Others using	X	O		†		†	

(†) Packard for their Rolls Royce output recommends Navy Symbols 1100 or 1100A (AN-VV-O-446) December 15, 1941.

(X) Ford - Buick - Chevrolet - Continental

(O) Studebaker

6000 Research Workers In Petroleum Industry

The number of research workers in the petroleum industry is now about 6000, of which approximately 45% are highly trained scientific men, Dr. Benjamin T. Brooks, consulting chemist, New York, states in a report to the American Chemical Society on "Petroleum Research and the War". There are 563 research workers for every 10,000 wage earners in the refining branch of the business, almost double the ratio in the chemical industry.

"The present war finds the common uses of petroleum by the armed forces vastly increased as to quantity," he stated, "and, in addition, the oil industry has shouldered the production of the new 100-octane aviation fuel, toluene and, in the last few months, synthetic rubber to meet the military and civilian requirements of rubber for ourselves as well as for our allies.

"The ability to satisfy these new war needs is due to the fact that, since 1912, the petroleum industry has greatly increased its staff of trained research and engineering personnel. In 1940, as compared with 1914, the American petroleum industry processed five times as much crude and 13 times as much gasoline, had 19 times the tonnage of tankers and 20 times the trained research personnel."

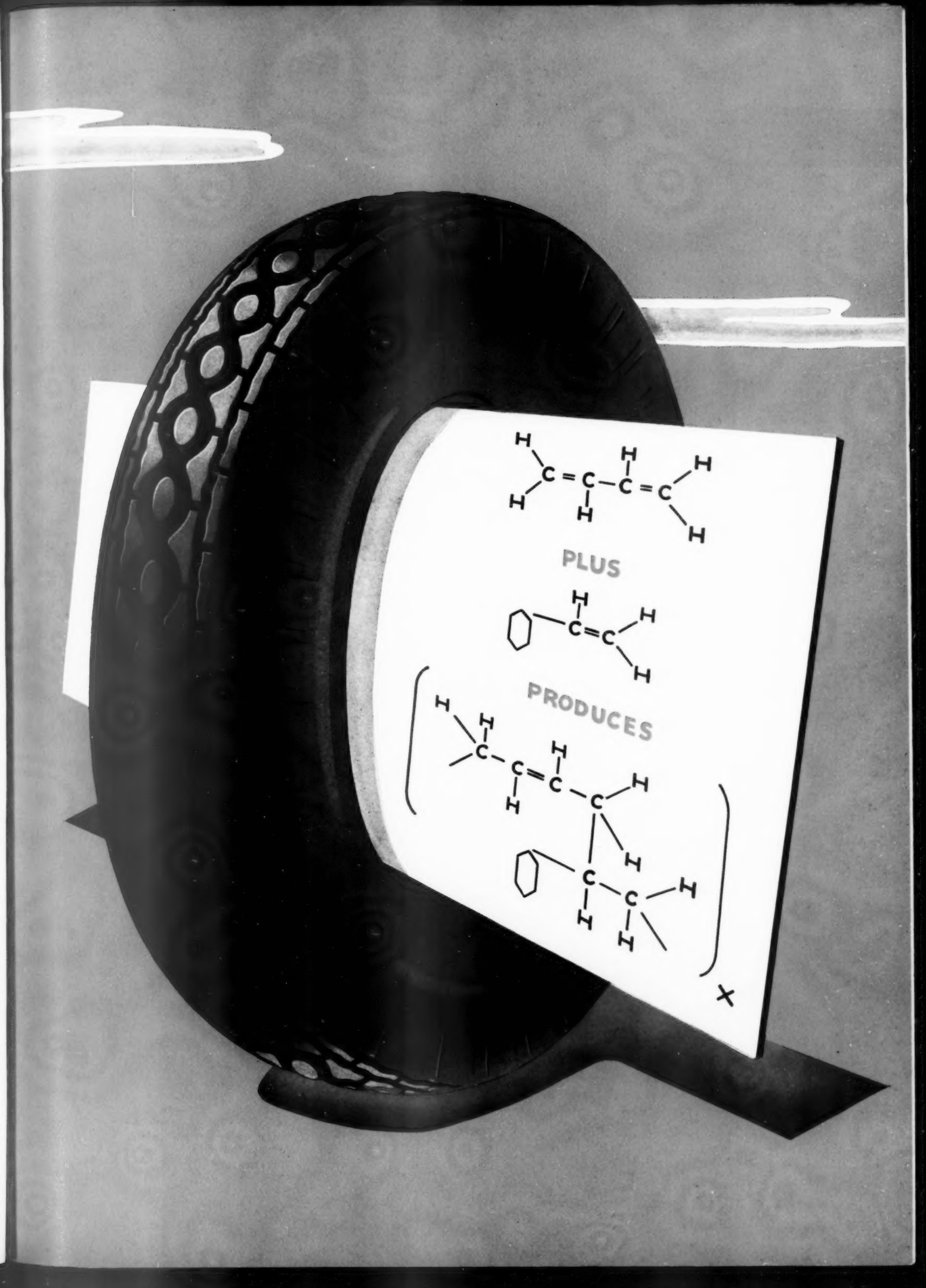
Fall S.A.E. Meeting in Tulsa

The Society of Automotive Engineers has scheduled its National Fuels and Lubricants Meeting for Oct. 22-23, at Tulsa. Both technical and general sessions will be held. Subjects tentatively scheduled include crankcase oil stability, bearings and corrosion and new methods for recording and evaluating piston skirt deposits.

The Society will hold a War Production-Engineering meeting and display in Detroit, Jan. 11-15, to replace the 1943 annual meeting. A West Coast Transportation and Maintenance meeting will be held in Los Angeles, Aug. 20-22, 1942, and the National Aircraft and Production meeting and display in Los Angeles, Oct. 1-3, this year.

Welding Standards Revised

The American Welding Society has published revised editions of two earlier bulletins on welding standards entitled "Standard Methods for Mechanical Testing of Welds", and "Definition of Welding Terms and Master Chart of Welding Processes". The former describes in detail the principle mechanical tests applied to welds and has a section on etching reagents and procedures for etching. The latter gives standard definitions of welding terms adopted by the Society, illustrated and indexed and a chart of the different welding processes. These revised standards are available at 40c a copy from the American Welding Society, 33 W. 39th St., New York.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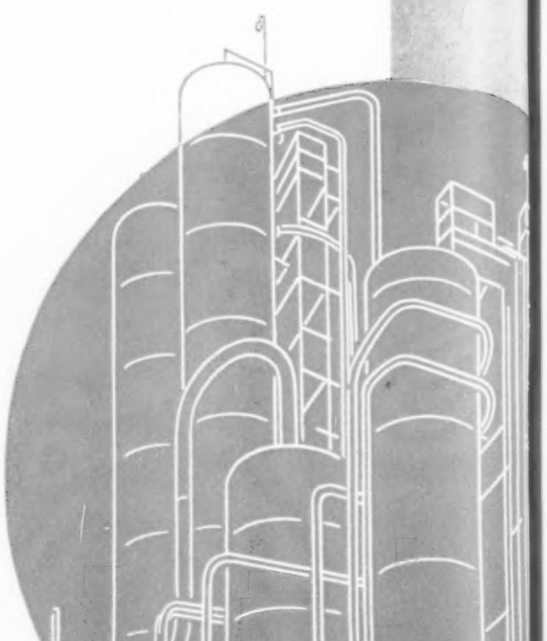
BUTADIENE CAPACITY*

A large proportion of the projected
STYRENE PLANTS*

These products are polymerized into
SYNTHETIC RUBBERS

Now under construction are eight Lummus Thermofor Catalytic Cracking plants employing eighteen reactors and producing Butane-Butylene raw material for Butadiene plants. In addition, these Lummus T. C. C. plants will produce aviation base stock, and B-B stock for aviation alkylate.

*Restrictions in the public interest prohibit the publication of contract figures or locations or capacities of plants under construction.



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LUMMUS
PETROLEUM REFINING PLANTS

In Defense of Our Patent System

Part 1—The U. S. Patent System Makes Possible American Mass Production Methods, which Create Our High Standard of Living

By John A. Dienner*

The established concept of our Patent System, that of providing opportunities for him who will create new things, should by all means be preserved, for, while it has been of enormous benefit to the public in stimulating industrial progress in years past, it is of even greater importance to our national economic structure today. Also it will stimulate American ingenuity to answer the grim challenge of war.

So states a patent law authority of the country, John A. Dienner, of Chicago, in a recent address before the American Institute of Chemists, in which he points out the danger of the promulgation of the unsound views expressed toward the Patent System by the Justice Department and a Justice of the U. S. Supreme Court. The first portion of his address is published here; the second and concluding portion will appear in the next issue.

Our American Patent System, it is pointed out in the first part, by protecting the patentee while he is working out his methods for manufacturing his new article and while he is planning his markets, and by continuing that protection on later improvements on his invention, made possible the mass production methods in which this country has so greatly surpassed all other nations. These developments took place during the earlier days of limited transportation and confined market areas.

"If we are to maintain our high standard of living, of plentiful and excellent goods at low prices," states this authority, "we must make possible the continuance of mass production or its equivalent. We must make possible nationwide advertising, so the producer can tell his story to every interested individual and we must make possible a free and easy interchange of goods throughout the nation."

"At the heart of all this," he stated, "is the full use of the Patent System, in order to promote progress of science and useful arts and to provide a means whereby the public regularly pays for that progress which it enjoys, by permitting the inventor or discoverer to have the exclusive right for a limited time to furnish his invention to the public."

The second part of this paper answers the criticisms of the Patent System heard in high places today, and discusses some of the changes in the patent law which have been proposed.

* * *

AN integral part of the American Way is the granting of patents for inventions. It is one of the basic American concepts that opportunity is open to every man to improve his lot by his own effort and ingenuity. Embedded in the Constitution is the specific power of Congress—"to promote the progress of science and useful arts by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries." (*Art.* 1, *Sec.* 8)

That the stimulus of the American Patent System has kept alive and vigorous the spirit of invention in America is beyond the power of any informed person to deny. The growth of the nation from a scant 4,000,000 souls scattered through the 13 original Colonies along the Eastern Seaboard in 1790 when the U. S. Patent System was born, to the vast nation of 130,000,000 people across the full width of the Continent was vastly accelerated by the fruits of the Patent System.

The winning of the Continent and the establishment of the nation as we know it was made possible by the ingenuity of our inventors. The Kentucky rifle, a unique contribution of American ingenuity of the pre-Revolutionary period, aided in freeing us from the Royal Oppressor and saved us from the ruthless savage. The steamboat opened our rivers to trade and transportation.

The railroads and the telegraph tied the vastly separated communities together and opened national markets. The American plow replaced the hoe of the peasant and turned the sod of the prairie. The reaper and harvester freed man from the back-breaking toil of the harvest for the first time since the dawn of history.

All these were but the forerunners and curtain raisers of an economic system of unbelievable productivity to follow. Those which we above mentioned were but the inventions which brought the land under the control of man and conquered distance.

And while that era of the expansion of settlement and the development of machine culture of the soil was well under way, the invention of new methods of processing raw materials and new products for the shops and factories was not neglected. Let me recall to you a few basic American contributions, selected somewhat at random, and there is no end of others:

1794	Cotton Gin	Whitney
1834	Reaper	McCormick
1840	Telegraph	Morse
1844	Vulcanized Rubber	Goodyear
1869	Airbrake	Westinghouse
1870	Celluloid	Hyatt
1874	Barbed Wire	Glidden
1876	Telephone	Bell
1886	Electric Welding	Thomson
1888	A. C. Induction Motor	Tesla
1889	Aluminum Process	Hall
1890	Linotype	Mergenthaler
1893	Photogravure	Ives
1895	Moving Pictures	Edison
1896	Carborundum	Acheson
1900	Thermo Plastics	Bakeland
1904	Glass Bottle Machine	Owens
1905	Audion	DeForest
1906	Airplane	Wright Brothers

This list is but suggestive; for each one I have selected you can name ten. From the American ingenuity and American genius for co-operation fostered by the peculiar freedom of the American Patent System grew that mighty instrument "mass production." Through it the American citizen rose to a plane of living the highest in all the world. By it the sword is being forged that will strike the tyrant low.

American ingenuity fostered and fed in the science and useful arts of peace has never shone more brilliantly than in its answer to the grim challenge of war. The mighty roar of production in the War of the Four Freedoms is the expression of the American mind, hand and spirit. The American mind has the genius to conceive. The American hand has the cunning to devise, and the American spirit has the courage to execute and to do the job.

American Inventions Cited

This is not vain boasting. It is not a promise of things to be revealed. Look at the past record of some American contributions to instruments of war. The principles which they embodied are in use to this day.

1. The Kentucky rifle
2. The Steamboat
3. The Ironclad Ship
4. The Screw Propeller
5. The Monitor Gun Turret
6. The Colt Revolver
7. The Repeating Rifle
8. The Whitehead Torpedo
9. The Submarine
10. The Gyroscopic Compass
11. The Airplane
12. The Tracklaying Tractor
13. The Dive Bomber
14. The Aircraft Carrier

And in the present battle of production, when the results can be revealed, American ingenuity and co-operation will be found to have achieved victory more glorious than any in the past.

Why does the entry of America into the war tip the scale? Surely not the number of people. China and India together have five times the population. Is it the

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John A. Dienner

THE AUTHOR

The author of the accompanying article has had wide training and experience which enables him to discuss the U. S. Patent System from the broadest possible viewpoint of public interest. He holds degrees in electrical engineering and patent law; served four years in the examining corps of the U. S. Patent Office and has engaged in the practice of patent law for over 25 years.

Appointed by the Secretary of commerce he has served as a member of the Patent Law Advisory Committee for 9 years. He was a U. S. delegate to the London Conference of 1934 and is an officer of the International Assn. for the Protection of Industrial Property. He was special counsel for the Department of Commerce in presenting evidence of the operation of the Patent System before the Temporary National Economic Committee in 1939. He is active in the American Bar Assn. and is a law school lecturer on foreign patent law.

gold in Kentucky and silver at West Point? India alone can outweigh us.

It is the farms, mines, workshops, laboratories and above all else, incomparable Yankee ingenuity and its capacity for mass production.

Over the years of peace through boom and depression, the American Patent System has stimulated and kept in practice the incomparable methods of thinking and doing which have kept us great in peace and make us unbeatable in war.

The pushing of social reform in which America has been engaged has been carried to certain excesses which have tended to injure other institutions. Social reform must not run too long on one track, or it will lose its way. One of the sufferers appears to be the Patent System. In the guise of social reform, the usefulness of the Patent System is being threatened.

The Patent System is a part of the economic system of capitalism and free enterprise. That it has been the basis of certain abuses in the past is not subject to question. The thing we are interested in is not the morality of certain users of the system, but rather it is to consider the utility of the system and to examine the actions of the courts and the legislators to see whether actions taken and proposed have the capabilities of improvement intended or of injury which should not be caused.

Founded Basis for Mass Production

Mass production, which has given Americans a stream of new conveniences, constantly better and at constantly lower prices, is directly attributable to the American Patent System. The first step in this direction was taken long ago, almost at the beginning of the U. S. Patent System, but the full development of the system of mass production was not attained until about the beginning of the present century.

In 1798, Eli Whitney, the same Eli Whitney who invented the cotton gin, laid the foundation for the American System of Mass Production in his factory at Whitneyville, Conn. He secured a government contract for the manufacture of firearms, and he instituted the division of labor and fabrication, by which each part was made separately, and interchangeable. This was the beginning of mass production. But it took much more to develop it to its full capability and the unique character of the American Patent System is to thank for this.

Inventor Fully Protected

The American Patent System, in counter distinction to any other in the world, makes the significant date upon which the inventor's rights depend as against a rival, that date when he actually made his invention. In all European countries the system prevails that the man who first files an application in the Patent Office (unless it can be shown that he stole it from another) secures the patent. That means that no man is safe in suggesting to another that he is working on a problem the solution of which involves the making of an invention. It means that no man is safe in revealing his invention to another until after he has filed his patent application. This compels a degree of secretiveness and suspicion of which we in America are completely free.

Here in America, if I wish to put into mass production so simple a thing as a new can opener, I can produce my model and then freely take it to the various suppliers of steel, of forgings, of paint, of wood for the handle, of rivets, or any other component parts, and discuss with specialists in steel, wood, forgings, rivets, etc. my particular problem, make whatever revisions are necessary and establish my machinery for production without fear of losing the right to my invention.

This peculiar freedom to disclose an invention which the American law permits is entirely lacking in European system. This freedom to discuss my invention in the various forms in which I may wish to make it allows me to take the necessary time to develop the tools for mass production, to size up my market, to arrange my sales outlets, to begin my national advertising, and then to produce the product continuously for the market.

Not only does the law permit me to disclose my invention before I must file my application, but the law guarantees that no one, except an original inventor, can make application in the U. S. Patent Office. A corporation or company cannot, under the guise of anonymity, file an application, and deprive me of my invention, as has long been permitted in European countries.

The inventor or company interested in the development of a new process can set up his experimental apparatus and test the reaction. Then he can try the process on a larger scale, through the semi-commercial scale, to full commercial scale, and be sure that his invention is workable. The American law protects him during this development. For an individual or enterprise particularly devoted to installation of processes such protection is indispensable.

Stimulates Improvement

Another beneficial provision in the American Patent Law, which has made it possible for American producers to give the public an enormous variety of new goods having new utility and of constantly better quality and at constantly lower price, is the provision that not only may an invention of primary importance be patented, but also improvements may be patented. The result is that, if I have put my can opener on the market in large volume, I can continue to have a protected market after the original patent expires, if I will meanwhile create a distinctive improvement in the same.

A patent on this distinctive improvement permits me to sell in a market protected by my improvement patent. The public is thereby paying for the improvement and the public is receiving a better product at a lowered cost of production.

Now it is true that this system of continuing the protected market through the improvement patent, in order to allow a manufacturer who has begun to supply a certain market to continue to hold that market with his improvement patents after expiration of the original patent, produces a certain rigidity of the economic structure.

If I continue to produce improvements on my can opener and furnish the improved can opener, I can, for a long time, exclude others from my market. There is a certain disadvantage to my competitors in this situation, but the over-all benefit to the public is the thing which controls.

So long as a manufacturer continues to give the public the benefit of improvements in the article which he furnishes, and at a price such that the people who constitute the great mass of buyers can pay, there can be no sound objection to the system. The American public has the power to choose between a more flexible economic system which will give greater choice of competing devices at higher prices, or the more rigid system of concentration of manufacture on a less variety of competitive articles, but at better quality and better prices.

If I read the signs correctly, the Amer-

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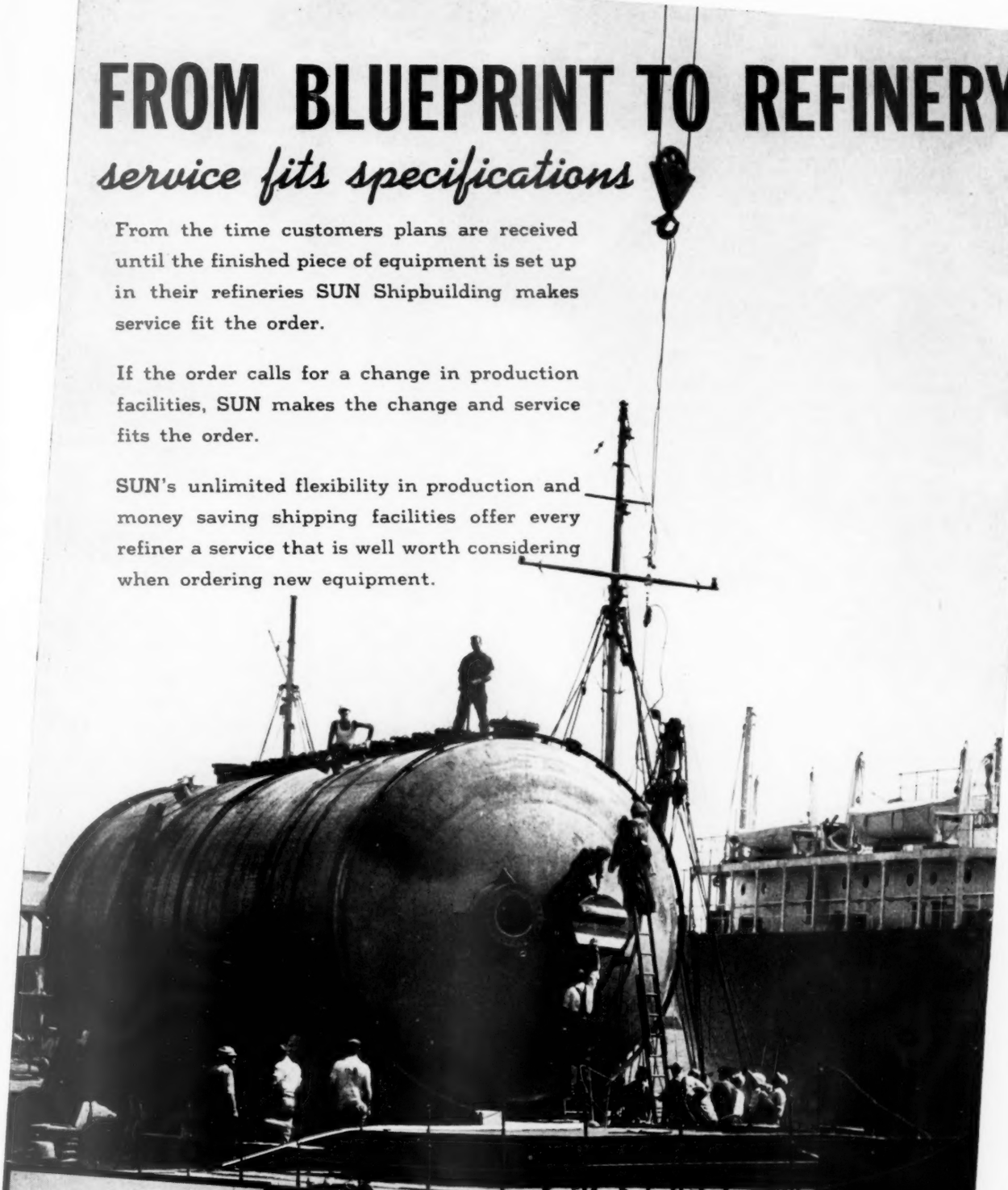

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ican public has overwhelmingly endorsed the second. It has resulted in a standard of living so far in excess of any which has ever prevailed elsewhere in the world that America has literally become a Utopia.

Provides Payment for Progress

The uninformed or unthinking person frequently remarks that things would be cheaper if there were no patents on them. Let us analyze the proposition.

Assume that patents were today abolished. No doubt, for a short time, things would be cheaper, because the public would then be refusing to pay for development which has been made on its behalf. Any competitor could then suddenly copy the device developed by another without the expense of paying royalty or developing the thing himself. But who would pay for subsequent developments?

To answer that question, let us go back in history. Let us consider one of the great creative nations—great in the past. China! China has made some of the most important technical contributions to civilization, and at a date long preceding the emergence of the Europeans from the Dark Ages. In fact, it was largely Chinese inventions which brought Europe out of the Dark Ages! China invented the printing press—movable type. China invented gun powder. China invented the magnetic compass.

These were the very instruments which created modern European civilization and in fact made possible the discovery of America. China made many other important inventions, and created technical processes, such as the manufacture of porcelain, the manufacture of silk, the manufacture of lacquers, etc.

The fault was not in the inventive character of the Chinese people. It was in the failure of any system of adequate reward to the inventor which would make the public pay for the progress which they would enjoy from the advent of such inventions and discoveries.

The American Patent System carries no taxes, no workings, and is not hindered in any manner. The reward therefore to the inventor is more direct and less burdened with difficulties than the system of any other country. The Patent System makes it possible for the inventor to call upon the public to contribute to the cost of his efforts in producing progress.

In other words, without a Patent System to make provision for the public to pay for the progress which science and the useful arts derive from inventors and discoverers, invention and discovery must be carried on at the expense of the inventors who are in no position to carry the expense. The public itself must pay for progress, and the Patent System is the method by which it is accomplished.

It is to be pointed out that, under present conditions in America, a corporation which carries on research work in its business can charge off against profits the cost of such research work, and the patent expense incidental thereto, as a cost of doing business, and thereby return to itself a part of its profits as distinguished from paying some of the same as taxes. In other words, at the present time, the tax laws permit the cost of invention, discovery and development to be reimbursed out of the public's pocket as a remission of taxes. That, however, is only temporary and changeable, and is not a permanent policy. Furthermore, the benefit does not go to the inventor, but goes only to the corporation or business enterprise.

However, you cannot start a new enterprise on remission of taxes. You need the Patent System to start new manufacturing enterprises. Remission of taxes is effective only when there is taxable income. To start a new enterprise on a patented process or product permits the patentee to secure directly from the public a suitable return which will include the development cost even before there are profits as such. Hence, the Patent System is and has been of enormous benefits to the American public in stimulating progress and in arranging ample payment and reward to those who will undertake to effect that progress.

Difficulties of Present Situation

The Patent System is an economic-social device. On the one hand, it is a method of opening up opportunity to him who will create new things, new utilities, new processes. On the other hand, it is a method of making the public pay for progress, and it is a regulator of business.

In recent years, the world has been in the throes of what we call "social reform." It appears to be an examination of conditions to see whether the distributable advantages of the world are being fairly distributed in proportion to the contribution of the respective participants in the world's work.

While there has been an enormous amount of careful and critical study and examination of our economic, social and political systems, there has been plenty of faulty thinking. People have been trapped by catch words and misled by fallacious economic theories. When the situation is analyzed, it will be seen that the present effort to produce social reform is attempting to effect two inconsistent purposes:

On the one hand is the drive to provide economic security. The more highly we become organized, the more necessary is it that the individual have a continued income; separate him from the payroll and all his rights are useless.

On the other hand, there is a desire to retain all personal freedom. That is inconsistent with economic security. As soon as you demand a continuous income, so soon must you accept a continuous obligation. In other words, to get your pay check every week you must punch the clock every day.

Of course, there are those who do not see the essential relation between the continuous rendering of service to secure the continuous income, and who would sit under their own vine and their own fig tree with no care in the world except to collect their $30 every Thursday.

But you cannot erect a civilization, nor maintain one, as Kipling said: "Where all men are paid for existing and no man must pay for his sins."

If we are to maintain a high standard of living, of plentiful and excellent goods at low prices, we must make possible the continuance of mass production or its equivalent. We must make possible nationwide advertising, so that the producer can tell his story to every interested individual, and we must make possible a free and easy interchange of goods throughout the nation.

Stimulus of Granting Patents

At the heart of all this is the full use of the Patent System in order to promote progress of science and the useful arts, and to provide a means whereby the public regularly pays for that progress which it enjoys by permitting the inventor or discoverer to have the exclusive right for a limited time to furnish his invention to the public.

The granting of one basic patent immediately touches off the mental processes of hundreds of scientists and engineers. Not only does the novel device or process or product create a utility which did not exist before, but it stirs the imagination of hundreds, or even thousands of other men, to develop and exploit the new field which such an invention opens up.

Frequently, the arrival of a new concept in the form of a patent is lacking in practicality, or arrives at the desired result in the hard way. That is a challenge to the inventive ability of others interested in the field in which the new concept lies.

The Official Gazette, which regularly comes into the hands of thousands of scientists and engineers, is one of the most stimulating books ever written. Scrutiny of the new device, process or product by men in many fields, many industries, and under many different conditions, stimulates in them the concept of a better way to do the same thing, or a way to do a new thing in the same or in another field.

(End Part 1)

Reprints Available

Reprints of this article will be available after Part 2 has been published in the August issue of REFINERY MANAGEMENT AND PETROLEUM CHEMICAL TECHNOLOGY. For prices write to NATIONAL PETROLEUM NEWS, 1213 W. 3rd St., Cleveland, Ohio.

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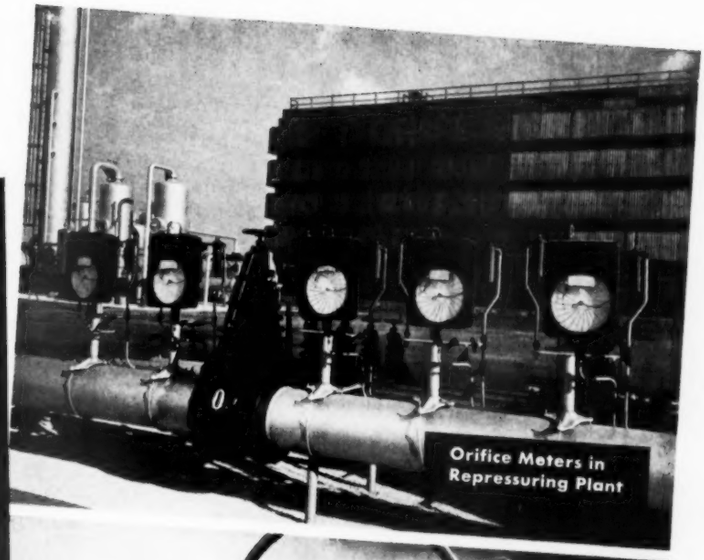
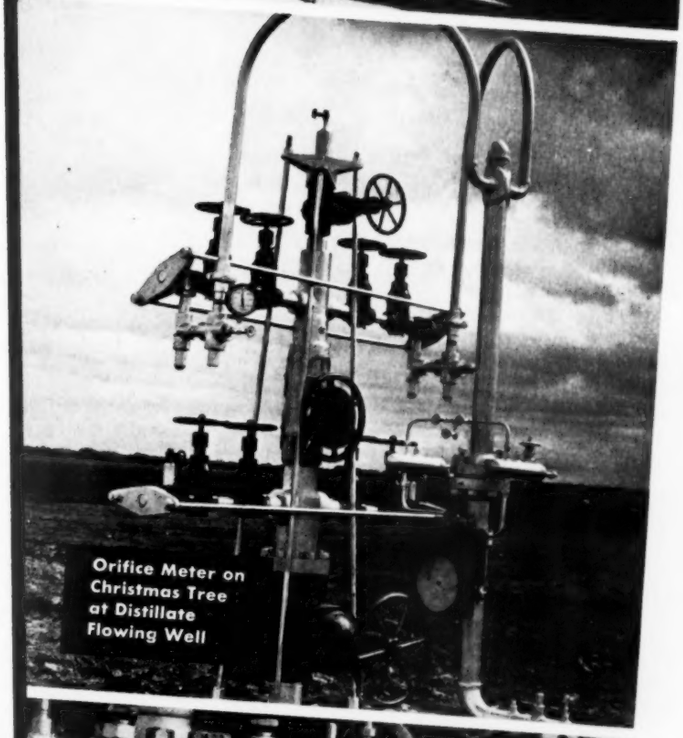
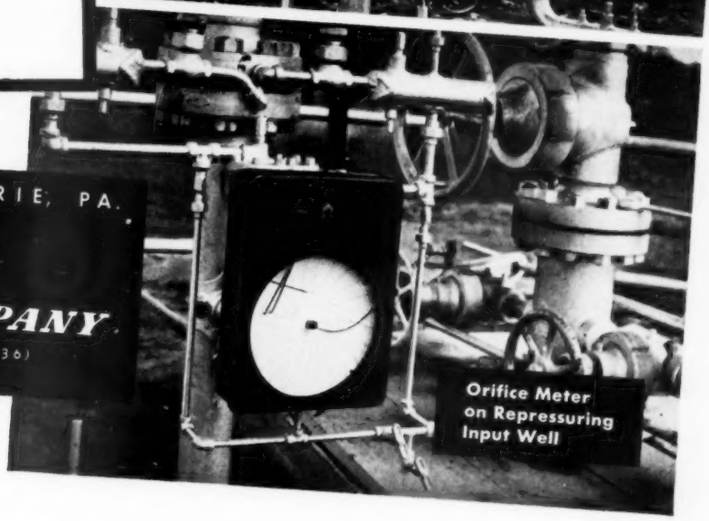


Orifice Meters in Repressuring Plant



Orifice Meter on Christmas Tree at Distillate Flowing Well



Orifice Meter on Repressuring Input Well

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This article which presents procedures for calculating the lead susceptibility of gasoline stocks from analyses of their sulfur content, will be found of practical value by refiners in offering a means for the conservation of tetraethyl lead in the manufacture of aviation and high quality motor gasolines . . . A method is provided for evaluating quantitatively, from sulfur analyses, the lead susceptibility at any degree of desulfurization, or sweetening; also of a blend of two or more stocks of similar hydrocarbon composition but varying sulfur content . . . Because of its length the article is presented in two parts . . . The summary was written especially for the Refinery Technical Section of NPN by Dr. H. H. Zuidema, of Shell Oil Co., Wood River, Ill.

Influence of Sulfur Compounds . . .

PART 1

On Gasoline Octane Number And Lead Susceptibility **

Introduction by H. H. Zuidema

The influence of sulfur compounds upon octane number either in the presence or absence of tetraethyl lead varies with the type as well as concentration of the sulfur compound.

With respect to clear octane number (A.S.T.M. Motor Method) polysulfide sulfur was the most detrimental type encountered, as little as 0.005% of t-butyl tetrasulfide lowering the octane number of a reformed gasoline by a whole unit. Disulfides are next in order, their effect, for constant concentration of sulfur, varying directly with the number of carbon atoms in the molecule. For example, 0.05% of sulfur in the form of di-n-heptyl disulfide lowered the octane number of this same gasoline by 0.8, while this same concentration in di-ethyl disulfide has an effect of only 0.3. The effect of mercaptans is analagous to that of disulfides, but of lower magnitude, 0.5% of n-heptyl and ethyl mercaptan lowering the octane number by 0.5 and 0.1, respectively. Sulfide and ring sulfur have no measurable effect upon clear octane number in concentrations up to 0.1%.

These generalizations make it possible to predict qualitatively at least, the effect of various sweetening processes upon octane number. Removal of mercaptans results in a gain in octane number, while conversion to disulfide causes a slight loss. Formation of polysulfides result in a sizable drop in octane number.

With regard to lead susceptibility (again by the Motor Method) all sulfur compounds have a detrimental effect, but the magnitude again varies with the type as well as concentration. However, the effect is independent of the hydrocarbon portion of the molecule, varying only with the sulfur-type. Ring sulfur is the least detrimental, with sulfide next, disulfide (and/or mercaptan) next, and polysulfide sulfur the most harmful. For a constant concentration each of these four classes is in order approximately 2.3 times as effective as the previous one in lowering lead susceptibility.

In each case there is a logarithmic relationship between concentration and effect on lead susceptibility, the greatest relative effect being obtained with the first addition of sulfur. It is possible by means of these relationships to calculate quantitatively from group sulfur analyses and a single determination of lead susceptibility, the lead susceptibility at any degree of desulfurization of sweetening.

Another practical application is the calculation of the lead susceptibility of a blend of two or more stocks of similar hydrocarbon composition but varying sulfur content. The calculated results agree closely with the experimental values, and are always lower than the arithmetic mean of the value for the components, due to the logarithmic nature of the relationships.

By Julian G. Ryan*

Aviation and automotive gasolines of high antiknock quality involve in their manufacture the use of large quantities of tetraethyl lead by the petroleum industry. Vitally important to conservation of this strategic material is the study of factors which affect antiknock characteristics. One of the factors requiring serious consideration is the influence of sulfur compounds.

Conclusive evidence has been compiled during the past decade that sulfur compounds decrease antiknock rating and response to tetraethyl lead. Hebl and Rendel (8) in studies with the Ricardo variable-compression engine pointed out in 1932 that susceptibility to tetraethyl lead varies with the crude source, volatility, and manufacturing process and that certain sulfur types may be detrimental. Schulze and Buell (20) and Birch and Stansfield (1) added sulfur compounds to straight-run gasoline and to blends of isooctane with n-heptane, respectively, and demonstrated that the deleterious effect varies with the class of sulfur compounds and this effect per unit increment of sulfur may be greater the lower the sulfur content. Indications also were obtained that structural differences among individual members of a class may have some influence.

Numerous investigators (2, 10, 14, 17, 19, 21, 26) have called attention to possible economies obtainable through applications of various desulfurization processes. Previous efforts (3, 6) to correlate simultaneously lead susceptibility, sulfur content, and hydrocarbon composition have not taken into account differences among sulfur types. Evaluation of the improvement resulting from desulfurization would be expedited if the quantitative effect of various types of sulfur compounds and the influence of hydrocarbon composition were known.

Method of Study

The procedure involved in this study comprised three steps: first, addition of purified sulfur compounds to a reformed

*Shell Oil Co., Inc., Wood River, Ill.
**Presented before the Petroleum Division, American Chemical Society, April 21, Memphis, Tenn.

gasoline of very low sulfur content; second, evaluation of the quantitative effect upon octane number (ASTM Motor Method) and lead susceptibility; third, application of the results to gasolines of different hydrocarbon composition. Details concerning preparatory steps are as follows:

Purification of Sulfur Compounds

The sulfur compounds employed in this study were, with the exceptions noted, obtained commercially (Eastman Kodak) and purified by fractionation in a column of ten theoretical plates at a ten-to-one reflux ratio. Three polysulfides, n-butyl trisulfide, t-butyl trisulfide, and t-butyl tetrasulfide were prepared in these laboratories according to the method of Klason (11) and purified by distillation under high vacuum.

Group Sulfur Analysis

The methods employed for determination of the various sulfur groups in gasoline are based on the analytical scheme of Faragher, Morrell, and Monroe (5) and the test methods of the Universal Oil Products Co. (25), which have been modified and improved by Shell Development Co. (22).

Total Sulfur—ASTM Method D90-41T is used only for sulfur contents above 0.05%wt. and is modified by application of a nitric acid correction. Reproducibility in total sulfur content by this method is approximately ±0.004%wt.

Sulfur contents below 0.05%wt. are determined by a special method which is a combination of the ASTM procedure for burning the sample and absorbing the products of combustion and a turbidimetric method for determination of barium sulfate (23). Reproducibility in total sulfur content is about±0.0004%wt.

Mercaptan Sulfur—The potentiometric titration method devised by Tamele and Ryland (24) and described by U.O.P. as Method N163-40 (25) is employed. Reproducibility is about ±0.0002%wt.

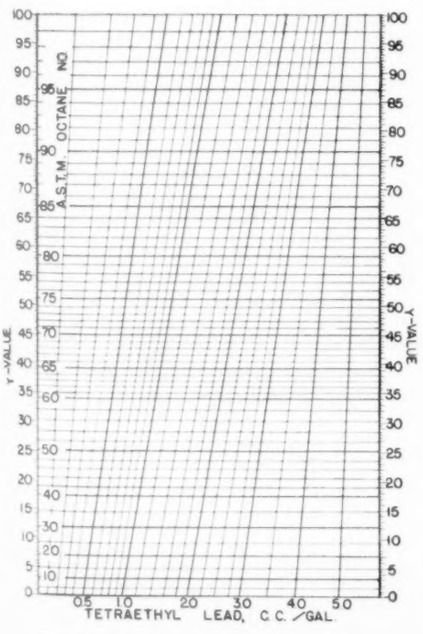


Fig. 1—Lead susceptibility chart

Disulfide Sulfur—A method similar in principle to U.O.P. Method A19-40 (25) is used, the difference being determination (by potentiometric titration) of the mercaptan sulfur obtained on reduction. Special precautions are taken to prevent loss of mercaptans. Reproducibility is of the same order as in the mercaptan-sulfur determination.

Thioether Sulfur and Ring Sulfur—U.O.P. Method A119-40 with minor modification is employed. Reproducibility is dependent on the total sulfur method.

Polysulfide Sulfur—No quantitative method is available. A qualitative test for polysulfides formed during doctor treatment is described in the literature (12).

Lead Susceptibility Values

Lead Susceptibility Chart—Improved methods designed to eliminate precision errors in translating engine results into lead-susceptibility values, according to the definition and chart of Hebl, Rendel, and Garton (9), were devised. These procedures comprise an analytical method for highest precision and a graphical method for routine work. In principle, the analytical method consists of the evaluation, from octane number vs. lead concentration data, of coordinates which when plotted on a rectangular system determine the same line that the original data determined on the chart. These coordinates are obtained from a graphical relation between ordinate (y-value) and octane number, and from a table relating abscissa (x-value) and concentration of tetraethyl lead at any given ordinate. (A linear ordinate scale ranging from 0 to 100 covers the range of 0 to 100 octane number, and a linear abscissa scale ranging from 0 to 6 covers the range of 0 to 6 cc. tetraethyl lead per gallon.) With the co-ordinates of the points thus precisely determined, the slope of the best straight line is evaluated by the method of least squares. Finally, from the slope the lead-susceptibility value can be determined from the relation between these two quantities, which has been calculated upon the basis of the present definition of lead susceptibility (9).

Table 1—Conversion of Slope to Lead Susceptibility

Slope	Lead Susceptibility	Slope	Lead Susceptibility	Slope	Lead Susceptibility
0.00	0.00	2.70	0.78	5.40	1.87
0.10	0.03	2.80	0.81	5.50	1.92
0.20	0.05	2.90	0.85	5.60	1.97
0.30	0.08	3.00	0.88	5.70	2.02
0.40	0.10	3.10	0.92	5.80	2.07
0.50	0.12	3.20	0.96	5.90	2.11
0.60	0.15	3.30	0.99	6.00	2.16
0.70	0.17	3.40	1.03	6.10	2.21
0.80	0.20	3.50	1.07	6.20	2.26
0.90	0.22	3.60	1.11	6.30	2.31
1.00	0.25	3.70	1.15	6.40	2.36
1.10	0.27	3.80	1.19	6.50	2.41
1.20	0.30	3.90	1.23	6.60	2.46
1.30	0.33	4.00	1.27	6.70	2.52
1.40	0.36	4.10	1.31	6.80	2.57
1.50	0.39	4.20	1.35	6.90	2.62
1.60	0.42	4.30	1.39	7.00	2.67
1.70	0.45	4.40	1.43	7.10	2.72
1.80	0.48	4.50	1.47	7.20	2.78
1.90	0.51	4.60	1.52	7.30	2.83
2.00	0.54	4.70	1.56	7.40	2.89
2.10	0.57	4.80	1.60	7.50	2.94
2.20	0.61	4.90	1.65	7.60	3.00
2.30	0.64	5.00	1.69	7.70	3.05
2.40	0.68	5.10	1.74	7.80	3.11
2.50	0.71	5.20	1.79	7.90	3.17
2.60	0.74	5.30	1.83	8.00	3.23

In the graphical method, the lead-susceptibility chart is constructed exactly according to the instructions of Hebl, Rendel, and Garton (9) and a vertical scale of y-values ranging from 0 to 100 is accurately drawn along the 0 cc. and 6.0 cc. lines, with the result shown in Fig. 1.

In the use of this chart, the data relating octane number and concentration of tetraethyl lead (cc. per gallon) are plotted; the best straight line is passed through the points and extended to the 0-cc. and 6.0-cc. lines. The "slope" is then calculated as the difference between the y-values (at 6.0 cc and 0 cc. tetraethyl lead per gallon) divided by 6.0 (the difference in x-values of the two points). The lead susceptibility value corresponding to this slope is obtained from the relation between these two quantities. given in Table 1.

Example:

Cracked Gasoline

y-value at 6.0 cc. TEL/gal.	59.1
y-value at 0 cc. TEL/gal.	42.9
Difference	16.2

$$\text{Slope} = \frac{16.2}{6.0} = 2.70$$

Lead-Susceptibility value (Table 1) = 0.78

Humidity Control—Throughout this study the moisture content of the intake air was maintained at 80 ± 5 grains of water per pound of dry air (72 ± 4% absolute humidity at 70°F.). With controlled humidity the average deviation in lead susceptibility was 0.04 units.

Engine Test Method—The results of this investigation apply only to the ASTM Motor Method. For highest precision, all possible octane numbers have been determined by direct comparison at each concentration of tetraethyl lead.

Properties of Base Stock—Because of its low sulfur content a Rodessa reformed gasoline containing 0.0033%wt. sulfur

was selected as a base stock. The properties are given in Table 2.

Table 2—Properties of Rodessa Reformed Gasoline

Sulfur Content, %wt.	
Total	0.0033
Mercaptan	0.0000
Disulfide	0.0003
Thioether	0.0009
Ring	0.0021
Bromine Number (18)	31
Specific Dispersion at 25°C	128.6
Aromatic Content, %wt. (7)	33
Induction Period, minutes	329
Specific Gravity at 25°/4°C	0.784
Reid Vapor Pressure, lb./sq. in.	4.0
ASTM Distillation, °F.	
IBP	185
10% rec. at °F.	225
50% rec. at °F.	270
90% rec. at °F.	333
FBP	392
Octane Number	
ASTM Motor	71.0
Research	79.1

Effect of Sulfur Compounds On Octane Number

The influence of various types of sulfur compounds upon octane number in the absence of tetraethyl lead was investigated by adding purified sulfur compounds to the Rodessa reformed gasoline and obtaining octane-number comparisons (ASTM Motor Method) with the base stock. Thioethers and ring-sulfur compounds at a concentration of 0.10%wt. of sulfur or lower were found to have no measurable effect upon octane number. Mercaptans, disulfides, and polysulfides, on the other hand, exhibited a definite and increasingly severe adverse effect, in the order named, upon antiknock properties.

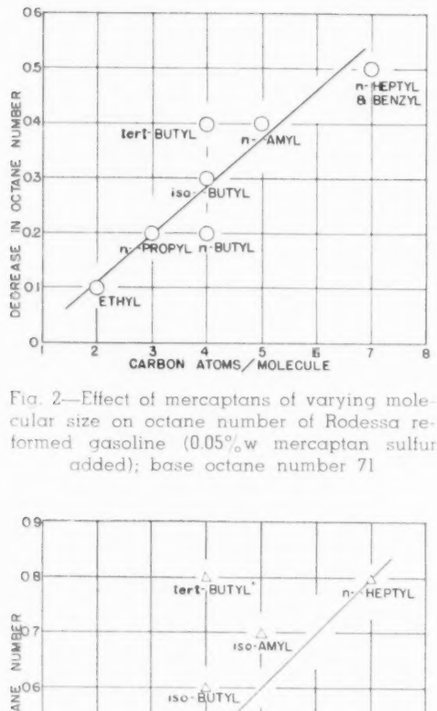


Fig. 2—Effect of mercaptans of varying molecular size on octane number of Rodessa reformed gasoline (0.05%w mercaptan sulfur added); base octane number 71

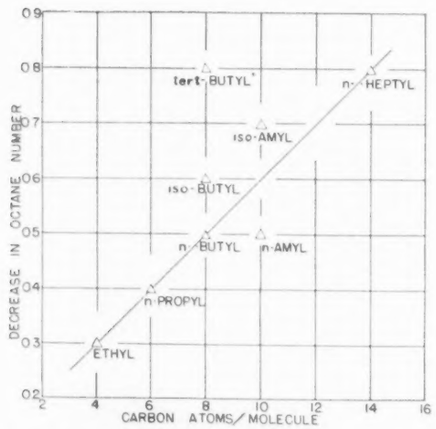


Fig. 3—Effect of disulfides of varying molecular size on octane number of Rodessa reformed gasoline (0.05% w disulfide sulfur added) base octane number 71

Mercaptans and Disulfides

The influence of various mercaptans and disulfides upon octane number is shown in Figs. 2 and 3. Decrease in octane number resulting from the addition of mercaptans and disulfides at a concentration of 0.05%wt. of sulfur is expressed as a function of molecular size of the sulfur compound (i. e., number of carbon atoms per molecule).

A comparison of Figs. 2 and 3 reveals that disulfides have a slightly more detrimental effect upon octane number than have the corresponding mercaptans. Thus, it is evident that, in the doctor treatment of gasoline, a slight loss in octane number cannot be avoided, even under ideal conditions in which mercaptans are converted quantitatively to disulfides.

Among the normal or straight-chain mercaptans and disulfides shown in Figs. 2 and 3, the detrimental effect upon octane number increases uniformly with increase in molecular weight or boiling point. Branched-chain isomers, however, exhibit a somewhat greater effect than do the corresponding straight-chain compounds. Thus, it appears that in order to predict accurately the improvement in octane number to be gained by removal of mercaptans as compared with their conversion to disulfides, a knowledge of not only the concentration of mercaptans present but also of their molecular structure and distribution in the gasoline would be necessary.

From the foregoing discussion, the relation between molecular structure of the mercaptans and disulfides and tendency to cause knock may be characterized by the statement that in a homologous series the tendency to knock increases with increase in the length of the carbon chain or boiling point, and in an isomeric series, the tendency to knock increases with increase in the number of side-chains. It is interesting to note that this behavior is in qualitative agreement with the relative thermal stabilities of the individual mercaptans and disulfides. (Mercaptans and disulfides are reported to decrease in thermal stability with increase in chain length, and branched-chain mercaptans are indicated to be less stable than are their straight-chain isomers (4,13). This suggests the possibility that the effect of various mercaptans and disulfides upon octane number is determined by the relative rates of decomposition of these sulfur compounds in the engine.

Polysulfides—The effect of the polysulfides, t-butyl trisulfide and t-butyl tetrasulfide, upon the octane number of the Rodessa reformed gasoline is shown in Fig 4. The octane numbers are expressed as differences from the result for the base stock.

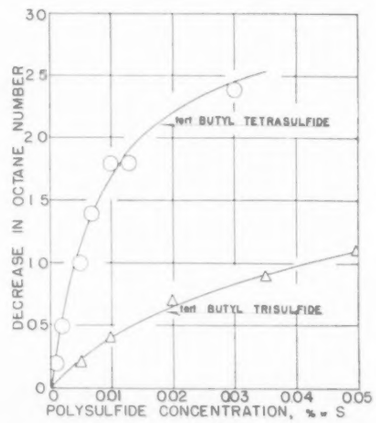


Fig 4—Effect of polysulfides on octane number of low-sulfur reformed gasoline (71.0 A.S.T.M. octane number)

Effect of Polysulfides

From Fig. 4 it is seen that a decrease in octane number of 0.5 units is obtained with the addition of only 0.002%wt. of sulfur as t-butyl tetrasulfide. Approximately six times this amount of sulfur as t-butyl trisulfide is required to produce an equal effect. The importance of avoiding polysulfide formation, particularly tetrasulfide formation, during doctor treatment is clearly evident.

As in the case of mercaptans and disulfides the relative effect of the two polysulfides upon octane number is in the same order as their relative thermal stabilities. Because the polysulfides readily liberate sulfur upon being heated, the effect of 0.005%wt. elementary sulfur upon octane number was determined. A decrease in octane number of only 0.2 unit was obtained. However, the possibility that the polysulfides are not active as such, but rather through a product of their decomposition, is not necessarily disproved. Substances formed "in situ" may be in a much higher state of activity and, hence, much more effective in promoting detonation. Their behavior may be analogous, although opposite in effect, to that of the suppression of detonation by tetraethyl lead. The mechanism for the action of tetraethyl lead is known to involve decomposition to elementary lead, and yet the high degree of activity to tetraethyl lead as an antiknock agent is in direct contrast with the inactivity of colloidal lead sols added to gasoline (15, 16).

Effect of Sulfur Compounds On Lead Susceptibility

The effect of various types of sulfur compounds upon lead susceptibility was determined by adding purified sulfur compounds and obtaining octane number comparisons with the base stock at each concentration of tetraethyl lead. Mercaptans, disulfides, polysulfides, thioethers, ring-sulfur compounds, and hydrogen sulfide were investigated. A complete tabulation of results is given in Table 3. Lead susceptibility (as defined by Hebl, Rendel, and Garton) is plotted

Table 3—Effect of Sulfur Compounds on Octane Number and Lead Susceptibility of Low-Sulfur Reformed Gasoline

Added Sulfur Compound	Total Sulfur Content, % wt.	ASTM Oct. No. at cc TEL/Gal. 0	0.5	1.0	2.0	3.0	Lead Suscept. (9)
None	0.0033	71.0	75.8	78.9	81.9	83.5	1.29
Thiophene	0.023	+0.1	—0.1	—0.4	—0.6	—0.8	1.20
Thiophene	0.053	0.0	—0.4	—0.7	—1.0	—1.2	1.13
Thiophene	0.103	0.0	—0.7	—0.9	—1.0	—1.6	1.08
Thiophene	0.292	—0.5	—1.9	—3.5	—3.8	—3.8	0.88
n-Propyl Sulfide	0.023	+0.1	—0.3	—1.3	—1.5	—1.1	1.11
n-Propyl Sulfide	0.053	—0.2	—0.5	—2.1	—2.2	—1.5	1.02
n-Propyl Sulfide	0.103	—0.1	—0.6	—2.4	—2.2	—2.1	0.97
n-Butyl Sulfide	0.310	—1.9	—4.1	—5.5	—5.8	—6.3	0.68
n-Butyl Mercaptan	0.053	—0.2	—1.3	—2.6	—3.5	—3.3	0.82
n-Propyl Mercaptan	0.053	—0.2	—1.1	—2.5	—3.2	—3.7	0.82
n-Amyl Mercaptan	0.053	—0.4	—0.9	—2.3	—3.3	—3.9	0.80
iso-Butyl Mercaptan	0.053	—0.3	—1.4	—3.4	—4.0	—4.0	0.76
t-Butyl Mercaptan	0.053	—0.4	—1.0	—2.8	—3.4	—3.3	0.83
Hydrogen Sulfide	0.053	—0.2	—1.2	—2.8	—3.5	—3.5	0.82
n-Propyl Disulfide	0.0075	0.0	0.0	—0.5	—0.6	—0.6	1.18
n-Amyl Disulfide	0.0105	+0.1	. . .	—0.5	—1.3	—0.8	1.14
n-Propyl Disulfide	0.023	—0.3	—0.8	—2.0	—2.1	—2.4	1.03
n-Propyl Disulfide	0.053	—0.4	—0.9	—2.9	—3.7	—3.7	0.84
t-Butyl Disulfide	0.053	—1.0	—2.5	—4.1	—3.8	—3.9	0.85
n-Amyl Disulfide	0.053	—0.5	—1.0	—2.4	—3.0	—3.4	0.84
iso-Amyl Disulfide	0.053	—0.7	—1.4	—3.1	—3.9	—3.1	0.86
n-Propyl Disulfide	0.103	—1.5	—1.9	—4.1	—4.8	—4.7	0.74
n-Butyl Disulfide	0.278	—2.5	—4.9	—6.4	—8.0	—8.5	0.49
n-Butyl Trisulfide	0.0067	0.0	—0.1	—0.4	—1.1	—0.5	1.15
n-Butyl Trisulfide	0.0166	—0.4	—0.7	—1.8	—2.4	—2.1	1.00
t-Butyl Trisulfide	0.013	—0.4	—0.8	—2.0	—2.7	—1.8	1.02
t-Butyl Tetrasulfide	0.005	—0.8	—0.4	—1.1	—0.9	—0.9	1.21
t-Butyl Tetrasulfide	0.008	—1.0	—1.5	—2.1	—1.7	—1.9	1.11
t-Butyl Tetrasulfide	0.013	—1.8	—2.3	—2.7	—2.8	—3.4	0.99
t-Butyl Tetrasulfide	0.033	—2.4	. . . .	—4.6	—5.8	—5.5	0.78
Elemental Sulfur	0.008	—0.2	. . . .	. . . .	—0.5	—0.3	1.27

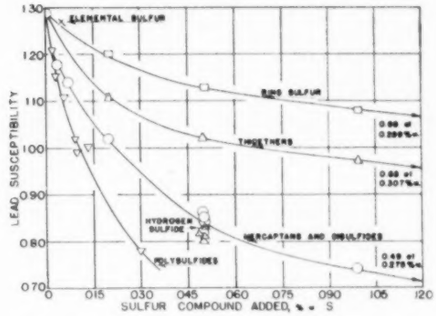


Fig. 5—Effect of various sulfur compounds on lead susceptibility of low-sulfur reformed gasoline

against concentration of added sulfur compounds (as expressed in percent by weight of sulfur in Fig. 5).

From Fig. 5 and Table 3, it is seen that the detrimental effect of sulfur compounds upon lead susceptibility increases in the order: ring-sulfur compounds, thioethers, mercaptans and disulfides and polysulfides. No significant difference is observed between the effect of the various mercaptans and disulfides. Likewise, the polysulfides tested all exhibited the same effect upon lead susceptibility. The class to which a sulfur compound belongs determines its effect upon lead susceptibility. In all cases, the effect per unit increment of sulfur is greater, the lower the sulfur content. In contrast with the effect of these sulfur compounds upon octane number in the absence of tetraethyl lead, it is evident that structural differences within a given series have little or no influence upon lead susceptibility.

Effect is Identical

Attention is directed to the fact that the effect of hydrogen sulfide upon lead susceptibility is identical with that of the mercaptans and disulfides. Since hydrogen sulfide and gaseous olefins are the primary thermal decomposition products of the mercaptans and disulfides, it is possible that formation of hydrogen sulfide in the engine is responsible for this similarity in effect upon lead susceptibility. Insofar as the other classes of sulfur compounds are concerned, it may be significant that the ease of pyrolysis of the various sulfur types is in exactly the same order as their relative effect upon lead susceptibility, the thermal stability decreasing in the order: ring-sulfur compounds, thioethers, mercaptans, and disulfides. There is obviously a difference in mechanism from that involved in the effect on octane number since the behavior of different polysulfides, disulfides, and mercaptans with respect to octane number varies within the groups, with possible overlapping between one group and the next; however, the effect upon lead susceptibility falls distinctly into groups, with very little if any variation within these groups.

Extrapolation of Lead Susceptibility To Zero Sulfur Content

When concentration of added sulfur compounds is plotted directly against per cent decrease in lead susceptibility of the Rodessa reformed gasoline, a family of concave-downward curves passing through the origin is obtained. Since the same data plot almost linearly on a logarithmic scale, it appears that an exactly linear relationship would be obtained on a sulfur-free basis; the constants in the logarithmic equations would then indicate disulfides to be approximately 2.3 times as effective as the others and 5.5 times as effective as ring sulfur. To test this possibility, a careful extrapolation of lead susceptibility to zero sulfur content is required.

This is done by means of successive approximations; the value 1.29 shown in Table 3 is taken as the lead susceptibility of the sulfur-free gasoline as a first approximation. This value is the average of 33 determinations made in the course of this investigation and is therefore well-established. The 0.0033%wt. of sulfur in the Rodessa gasoline consisted of 0.0003%wt. of disulfide, 0.0009%wt. of thioether, and 0.0021%wt. of ring sulfur, and corresponds to a total reduction of 8.5% in lead susceptibility, according to the approximate curves. From this result, a sulfur-free lead susceptibility value of

$$1.29 \times \frac{100}{100-8.5}$$ or 1.41 is obtained. This

value is used as the basis for a second approximation. The effect of the residual sulfur calculated from the new set of curves is found to be 9%, which is in substantial agreement with the result based on the first approximation. The value 1.41 for the lead susceptibility of the sulfur-free stock is therefore used for subsequent calculations in this work.

From the lead susceptibility values given in Table 3 for the various sulfur

Table 4—Relation Between Concentration of Various Types of Sulfur Compounds in Reformed Gasoline and Percent Decrease in Lead Susceptibility from the Value of the Sulfur-Free Stock

Added Sulfur Compound	Conc., %wt. of S	Lead Suscept.	Decrease in Lead Suscept.	Percent Decrease in Lead Suscept.
None	0.000	1.41	0	0
Thiophene	0.026	1.20	0.21	15
Thiophene	0.056	1.13	0.28	20
Thiophene	0.106	1.08	0.33	23.5
Thiophene	0.296	0.88	0.52	38
n-Propyl Sulfide	0.022	1.11	0.30	21
n-Propyl Sulfide	0.052	1.02	0.39	28
n-Propyl Sulfide	0.102	0.97	0.44	32
n-Butyl Sulfide	0.309	0.68	0.73	52
Mercaptans* and Hydrogen Sulfides	0.051	0.81	0.60	42
n-Propyl Disulfide	0.0053	1.18	0.23	16
n-Amyl Disulfide	0.0083	1.14	0.27	19
n-Propyl Disulfide	0.021	1.03	0.38	27
Disulfides†	0.051	0.85	0.56	40
n-Propyl Disulfide	0.101	0.74	0.67	47.5
n-Butyl Disulfide	0.276	0.49	0.92	65
n-Butyl Trisulfide	0.003	1.15	0.26	18
n-Butyl Trisulfide	0.013	1.00	0.41	29
t-Butyl Trisulfide	0.010	1.02	0.39	28
t-Butyl Tetrasulfide	0.002	1.21	0.20	14
t-Butyl Tetrasulfide	0.005	1.11	0.30	21
t-Butyl Tetrasulfide	0.010	0.99	0.42	30
t-Butyl Tetrasulfide	0.030	0.78	0.63	45

*Average results for n-butyl-, n-propyl-, n-amyl-, iso-butyl-, and t-butyl- mercaptan.
†Average results for n-propyl-, t-butyl-, n-amyl-, and iso-amyl disulfide.

compounds added to the reformed gasoline, the per cent decrease in lead susceptibility from the sulfur-free value (1.41) is computed, with the results shown in Table 4.

The relation between per cent decrease in lead susceptibility and concentration of the five sulfur types (polysulfides, mercaptans and disulfides, thioethers, and ring-sulfur compounds) is plotted on a rectangular scale in Fig. 6 and on a logarithmic scale in Fig. 7. A linear logarithmic relation is obtained. Since on rectangular co-ordinates, the curves intersect only at the origin, identical slopes are to be expected on a logarithmic scale, and this is seen to be the case. Fig 6 also indicates the agreement between the experimental data and curves calculated according to the logarithmic relation.

The general equation of the curves

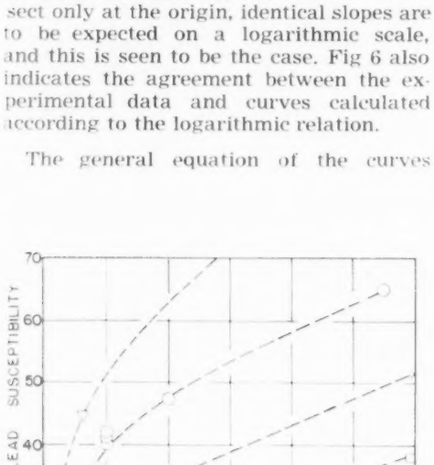


Fig. 6—Relation between concentration of various types of sulfur compounds and per cent decrease in lead susceptibility of Rodessa reformed gasoline

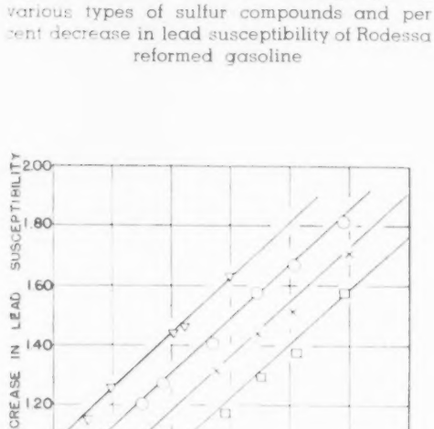


Fig. 7—Relation between logarithm of concentration of various types of sulfur compounds and logarithm of per cent decrease in lead susceptibility of Rodessa reformed gasoline

shown in Figs. 6 and 7 is of the type:

$$\log y = \log k_1 + k_2 \log C \quad (1)$$

where

y = % decrease in lead susceptibility
C = %wt. of a given sulfur type, multiplied by 1000 for convenience
k_1 and k_2 = line constants

The co-ordinates of the points given in Table 4 and shown in Fig. 7 (expressed as the logarithm of the percent by weight of sulfur times 1000 and the logarithm of the per cent decrease in lead susceptibility, respectively) are employed to calculate the slope and intercept, (or line constants k_2 and k_1) in equation (1) by the method of least squares.

The k_1-values, i.e., the y-values at C = 1 (0.001%wt. of sulfur), are found to be 12.0, 8.9, 6.6, and 4.8 for the polysulfides, mercaptans and disulfides, thioethers, and ring-sulfur compounds, respectively. An average slope k_2 value) of 0.36 is obtained. The equations thus become:

$$\text{(Polysulfides) } \log y_1 = \log 12.0 + 0.36 \log C_1 \quad (2)$$

$$\text{(Mercaptans and Disulfides) } \log y_2 = \log 8.9 + 0.36 \log C_2 \quad (3)$$

$$\text{(Thioethers) } \log y_3 = \log 6.6 + 0.36 \log C_3 \quad (4)$$

$$\text{(Ring Sulfur) } \log y_4 = \log 4.8 + 0.36 \log C_4 \quad (5)$$

The ratio of the concentrations at which exactly the same per cent decrease in lead susceptibility is obtained with each of the sulfur types can be calculated from the above equations. For convenience, the ratios will be based on mercaptan and disulfide sulfur (which will be referred to simply as disulfide sulfur):

If $\log y_1 = \log y_2 = \log y_3 = \log y_4$ and $C_2 = 1$,

then

$$C_1 = \frac{1}{2.29}, C_3 = 2.30, \text{ and } C_4 = 5.56.$$

It is thus seen that the disulfides are 2.30 times as detrimental as the thioethers and 5.56 times as detrimental as the ring-sulfur compounds, but the polysulfides are 2.29 times as detrimental as the disulfides. That is, to obtain a given per cent decrease in lead susceptibility with disulfides, thioethers, ring-sulfur compounds, and polysulfides, 5.56 times as much ring-sulfur, 2.30 times as much thioether sulfur, and $\frac{1}{2.29}$ times as much polysulfide sulfur is required as disulfide sulfur.

These factors permit the conversion of the sulfur compounds to a common type, thus simplifying the calculation of the per cent decrease in lead susceptibility in a mixture of the four types. For example, to convert all four types of disulfides:

$$\text{Equivalent \%wt. of S as RSSR} = \text{\%wt. of S as Polysulfides} \times 2.29 + \frac{\text{\%wt. of S as RSSR or RSH} + \text{\%wt. of S as RSR}}{2.30} + \frac{\text{\%wt. of S as Rings}}{5.56} \quad (6)$$

The above expression includes all sulfur types ordinarily encountered in gasoline. It is interesting to note that the weighting constants are approximately equal to 2.3 raised to the 1, 4, —1 and —2 power, respectively.

The simplified equation for the calculation of per cent decrease in lead susceptibility thus becomes:

$$\log y = 0.949 + 0.36 \log \left(\text{Polysulfides} \times 2.29 + \text{RSSR} + \frac{\text{RSR}}{2.30} + \frac{\text{Ring S}}{5.56}\right) \quad (7)$$

where the respective concentrations of polysulfide, disulfide, thioether and ring sulfur are expressed as %wt. x 1000.

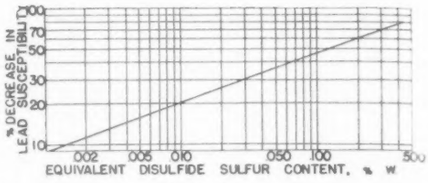


Fig. 8—Relation between equivalent disulfide sulfur content and per cent decrease in lead susceptibility from the value of the sulfur-free stock

Example:

If a gasoline of 0.130%wt. total-sulfur content should contain no mercaptans or polysulfides, 30% of disulfide sulfur (0.039%wt.) 25% of thioether sulfur (0.032%wt.) and 45% of ring sulfur (0.059%wt.), the per cent decrease in lead susceptibility would be:

$$\log y = 0.949 + 0.36 \log \left(39 + \frac{32}{2.30} + \frac{59}{5.56}\right)$$

$$\log y = 1.598$$

$y = 39.6\%$ decrease

Graphical Method of Calculation

The per cent decrease in lead susceptibility for a given type can also be obtained graphically, although with less precision than is obtainable by calculation. In this method the sulfur types are converted to disulfides (or to any one of the other types) in the usual manner (Equation 6), and the per cent decrease in lead susceptibility is read from the disulfide curve (or other appropriate curve). For convenience, a curve from which the per cent decrease in lead susceptibility for a given "equivalent disulfide" sulfur content can be read directly is shown in Fig. 8.

Scope of the Method

This method is limited to sulfur contents giving less than about an 80%-decrease in lead susceptibility from the value of the sulfur-free gasoline. This entails no limitation on the usefulness of the method in general, however, since very few gasolines contain sufficient sulfur to cause a percentage decrease of this magnitude (80%-decrease corresponds to 0.45%wt. of equivalent disulfide sulfur or 2.5%wt. of ring sulfur).

Comparison of Results

In order to test the relation developed between "equivalent disulfide" sulfur content and per cent decrease in lead susceptibility, the effect of adding the mixture of sulfur types described in the above-mentioned example to low-sulfur reformed gasoline was determined. (Composition: 0.039%wt. of disulfide, 0.032%wt. of thioether, and 0.059%wt. of ring sulfur). Similar experiments were also carried out in which the hydrocarbon composition was varied somewhat by the addition of 10% vol. of an aromatic or

unsaturated hydrocarbon mixture. The resulting octane-number and lead-susceptibility values are shown in Table 5.

The lead-susceptibility values for the gasoline containing 0.003% wt. of sulfur, shown in Table V, are extrapolated to zero sulfur content on the same basis as before, i.e., by correcting for a 9%-decrease in lead susceptibility due to the presence of 0.0011% wt. of "equivalent disulfide" sulfur. The extrapolated lead-susceptibility values and the calculated per cent decrease in lead susceptibility obtained therefrom are shown in Table 6.

The close agreement between the experimentally determined results (avg. 40.0) shown in Table 6 and the calculated value in the above example (39.6%) for per cent decrease in lead susceptibility indicates that the relation is applicable to mixtures of sulfur compounds and is unaffected by small changes in hydrocarbon composition.

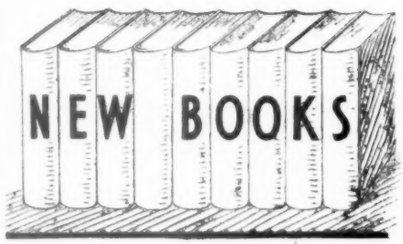
(End of Part 1)

Table 5—Effect of a Mixture of Sulfur Compounds Upon Lead Susceptibility of Reformed Gasoline Containing Various Added Hydrocarbons

Hydrocarbon Added	Total Sulfur Content, % wt.	ASTM Oct. No. at cc TEL/Gal. 0	0.5	1.0	2.0	3.0	Lead Suscept. (9)
None	0.003	71.0	75.8	78.9	81.9	83.5	1.29
None	0.133	—0.3	—2.3	—3.6	—3.7	—4.3	0.85
10% of Diisobutylene	0.003	74.8	80.0	81.8	84.1	85.8	1.17
10% of Diisobutylene	0.133	—0.6	—2.5	—2.7	—3.6	—3.5	0.78
10% of Benzene	0.003	72.8	77.2	80.2	82.7	84.9	1.26
10% of Benzene	0.133	—0.8	—2.2	—3.3	—4.0	—3.5	0.81
10% of C_5-Polymer	0.003	73.0	77.9	80.0	83.3	84.3	1.24
10% of C_5-Polymer	0.133	—0.5	—2.1	—3.6	—3.2	—2.8	0.80

Table 6—Effect of the Above Sulfur Compounds Upon the Percent Decrease in Lead Susceptibility

Hydrocarbons Added	Lead Susceptibility at Sulfur Content 0.000% wt.	0.133% wt.	Decrease in Lead Suscept.	Per Cent Decrease in Lead Suscept.
None	1.41	0.85	0.56	40
10% of Diisobutylene	1.26	0.78	0.48	38
10% of Benzene	1.38	0.81	0.57	41
10% of C_5-Polymer	1.36	0.80	0.56	41
Average				40



Revised Edition of Text On Chemical Refining

"Chemical Refining of Petroleum", by Kalichevsky and Stagner, has been revised and largely rewritten to include investigations and processes developed since the first edition was published in 1933. The book contains 550 pages, 100 more than in the first edition.

Vladimir A. Kalichevsky, of the research and development laboratories of Socony-Vacuum Oil Co., Inc., is author of other books on technical petroleum subjects.

Bert Allen Stagner is a consulting and research chemist with oil company experience.

The general plan and style of the text is unchanged from the first edition; many chapter headings are the same, or altered only slightly. However, the number of chapters has been reduced from 13 to 11 by combining the chapter on sweetening operations with that on reduction of total sulfur in light petroleum distillates and by eliminating the chapters on oxidation-reduction reactions and miscellaneous refining processes.

Discussions Expanded

A chapter concerning composition of petroleum takes the place of the old "Introduction", occupying almost double the space formerly devoted to this discussion.

Complete and extensive bibliographies appear at the end of each chapter. Arrangement is alphabetically by author, to which numerical reference in the text is keyed. The elimination of footnotes avoids distracting the reader's attention—a feature more books might copy. The footnotes appear at the end of each chapter.

Section listing supplementary patents not discussed in the text contains a more nearly complete list of U. S. patents but does not contain foreign patents or patents discussed in Kalichevsky's book "Modern Methods of Refining Lubricating Oils". Arrangement is chronological and by chapters to which subject matter refers.

As in the first text, sweetening, sulfuric acid, alkalies, absorption and solvents are discussed extensively; the chapter on detonation and anti-detonants has been expanded. New processes and developments have been incorporated throughout the book.

The chapter, "Sulfuric Acid Sludge", may be used as an example of the revision of the text. It is 6 pages longer. Section dealing with direct production of fresh concentrated or fuming acid from sludge, for instance, has been expanded to three times its former size and contains detailed descriptions of several processes now in commercial use.

The revised edition may be obtained through the book department of NATIONAL PETROLEUM NEWS, 1213 W. 3rd St., Cleveland, price $7.50, postpaid within U. S.

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Approved Tables of Volume-Temperature Correction Factors for Liquefied Petroleum Gases

ACCURATE tables of volume-temperature correction factors to 60 deg. F. base point and for the reduction of observed specific gravities to specific gravities at 60 deg. F. referred to water at 60 deg. F., for liquefied petroleum gases, have been prepared by Technical Committee of the Natural Gasoline Assn. of America. The temperature range covered by the tables is from —50 deg. to 140 deg. F.

Bulk commercial transactions in the l.p.g. products—propane, butane, propane-butane mixtures and pentane—are increasing and the general practice, as with motor gasoline, is to convert volume at actual loading, or unloading temperatures, to volume at 60 deg. F. Hence the desirability of accurate and generally acceptable volume correction factors.

To date, only N.G.A.A. has adopted these data officially, but the California Natural Gasoline Assn. is expected to do so in the near future. The data will be submitted to the American Petroleum Institute this fall for approval, and the U. S. Bureau of Standards is now studying them for anticipated adoption. The American Society for Testing Materials has also been sent copies for consideration.

Volume temperature factors contained in U. S. Bureau of Mines Bulletin 97, which the industry has used for years in making volume-temperature corrections on liquefied petroleum gases, were not based entirely on experimental data. A few actual experiments were made in the temperature range betwen 60 deg. and 100 deg. F. and results plotted; other points were extrapolated both ways and a table set up on this basis.

Hydrocarbons used at that time did not have the high degree of purity used in the work reported here, because they were not obtainable. In the case of heavier hydrocarbon mixtures, such as natural gasoline and motor fuels, the correction factors of U. S. Bureau of Standards Miscellaneous Publications C-410 only go to 100 deg. A.P.I. gravity and factors above that range are required in present operations.

Basis of Computation

Factors in the present work were computed from the experimental determination of orthobaric absolute densities of the individual hydrocarbons, two-component mixtures and three natural gasolines over the entire range.

The new factors and specific gravity tables (Tables 1 and 2) were presented before N.G.A.A. at its 21st annual convention, May 14-15, 1942, in a report entitled "The Density of L P.G. Hydrocarbons, Their Mixtures, and Three Natural Gasolines", by B. L. Carney, Shell Oil Co., Inc., on behalf of the Technical Committee.

Part of the experimental work of determining the densities was done at the University of Tulsa under direction of Prof. W. L. Nelson, and the balance in the laboratories of Phillips Petroleum Co. under direction of T. W. Legatski, chairman of the l.p.g. subcommittee. Volume and density correction tables were prepared from the density determinations by Dr. D. L. Katz and associates at the University of Michigan.

Below are excerpts from the report, complete copies of which may be secured by writing to the Natural Gasoline Assn. of America, W. F. Lowe, Secretary, 923 Kennedy Bldg., Tulsa—complete report also will be published in the association's "Proceedings":

"In the use of loading density tables for l.p.g. it is necessary to convert vol-

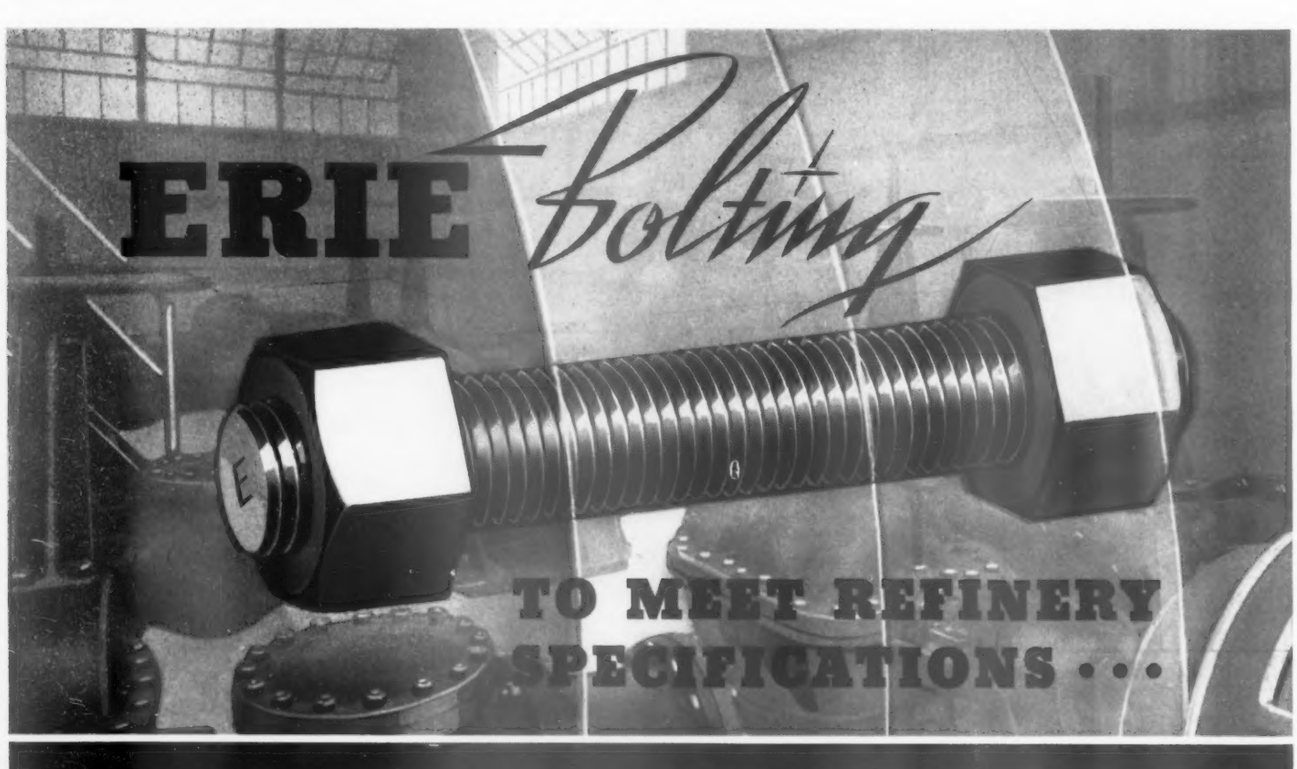

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Table 1—Liquefied Petroleum Gas Volume Correction Factors

DEGREES FAHRENHEIT	SPECIFIC GRAVITY AT 60° F/60° F																									
		PROPANE							ISO-BUTANE			N-BUTANE				ISO-PENTANE				N-PENTANE						
	0.500	0.5079	0.510	0.520	0.530	0.540	0.550	0.560	0.5631	0.570	0.580	0.5844	0.590	0.600	0.610	0.620	0.6246	0.630	0.6310	0.640	0.650	0.660	0.670	0.680	0.690	0.700
-50	1.160	1.155	1.153	1.146	1.140	1.133	1.127	1.122	1.120	1.116	1.111	1.108	1.106	1.102	1.098	1.094	1.093	1.091	1.091	1.089	1.086	1.084	1.082	1.080	1.078	1.077
-45	1.153	1.148	1.146	1.140	1.134	1.127	1.120	1.117	1.115	1.111	1.106	1.103	1.101	1.097	1.094	1.090	1.089	1.087	1.087	1.085	1.082	1.080	1.078	1.077	1.075	1.074
-40	1.147	1.142	1.140	1.134	1.128	1.122	1.117	1.111	1.110	1.106	1.101	1.099	1.097	1.093	1.090	1.086	1.085	1.084	1.083	1.081	1.079	1.077	1.076	1.074	1.072	1.071
-35	1.140	1.135	1.134	1.128	1.122	1.116	1.111	1.106	1.105	1.101	1.096	1.094	1.092	1.088	1.085	1.082	1.081	1.079	1.079	1.077	1.076	1.074	1.072	1.071	1.070	1.068
-30	1.134	1.129	1.128	1.122	1.116	1.111	1.106	1.101	1.100	1.096	1.092	1.090	1.088	1.084	1.081	1.078	1.077	1.076	1.075	1.073	1.072	1.070	1.068	1.066	1.065	1.063
-25	1.127	1.122	1.121	1.115	1.110	1.105	1.100	1.095	1.095	1.091	1.087	1.085	1.083	1.080	1.079	1.074	1.073	1.072	1.071	1.070	1.067	1.066	1.064	1.062	1.061	1.059
-20	1.120	1.115	1.114	1.109	1.104	1.099	1.095	1.090	1.089	1.086	1.082	1.080	1.079	1.076	1.073	1.070	1.069	1.068	1.067	1.066	1.063	1.062	1.060	1.058	1.057	1.056
-15	1.112	1.109	1.107	1.102	1.097	1.093	1.089	1.084	1.082	1.080	1.077	1.075	1.074	1.071	1.068	1.065	1.064	1.063	1.061	1.060	1.058	1.056	1.054	1.053	1.052	
-10	1.104	1.102	1.100	1.095	1.091	1.087	1.083	1.079	1.078	1.075	1.072	1.071	1.069	1.066	1.064	1.061	1.060	1.059	1.059	1.057	1.056	1.054	1.052	1.051	1.050	1.049
-5	1.098	1.096	1.094	1.089	1.085	1.081	1.077	1.074	1.073	1.070	1.067	1.066	1.065	1.061	1.059	1.057	1.056	1.055	1.055	1.053	1.052	1.050	1.048	1.047	1.046	1.045
0	1.092	1.088	1.088	1.084	1.080	1.076	1.072	1.069	1.068	1.066	1.063	1.062	1.061	1.058	1.055	1.053	1.052	1.051	1.051	1.050	1.048	1.046	1.045	1.044	1.043	1.042
2	1.089	1.085	1.085	1.081	1.077	1.074	1.070	1.067	1.066	1.064	1.061	1.060	1.059	1.056	1.053	1.051	1.050	1.049	1.049	1.048	1.046	1.045	1.044	1.043	1.042	1.041
4	1.086	1.083	1.082	1.079	1.075	1.071	1.068	1.065	1.064	1.062	1.059	1.058	1.057	1.054	1.051	1.049	1.049	1.048	1.048	1.047	1.045	1.043	1.042	1.041	1.041	1.039
6	1.084	1.080	1.080	1.076	1.072	1.069	1.065	1.062	1.061	1.059	1.057	1.055	1.054	1.052	1.050	1.048	1.047	1.046	1.046	1.045	1.043	1.042	1.041	1.040	1.039	1.038
8	1.081	1.078	1.077	1.074	1.070	1.066	1.063	1.060	1.059	1.057	1.055	1.053	1.052	1.050	1.048	1.046	1.046	1.045	1.045	1.044	1.042	1.040	1.039	1.038	1.037	1.036
10	1.078	1.075	1.074	1.071	1.067	1.064	1.061	1.058	1.057	1.055	1.053	1.051	1.050	1.048	1.046	1.044	1.044	1.043	1.043	1.042	1.040	1.039	1.038	1.037	1.036	1.035
12	1.075	1.072	1.071	1.068	1.064	1.061	1.059	1.055	1.055	1.053	1.051	1.049	1.048	1.046	1.044	1.042	1.042	1.041	1.041	1.039	1.038	1.037	1.036	1.035	1.035	1.034
14	1.072	1.070	1.069	1.066	1.062	1.059	1.056	1.053	1.053	1.051	1.049	1.047	1.046	1.044	1.042	1.041	1.040	1.039	1.039	1.038	1.037	1.036	1.035	1.034	1.033	1.032
16	1.070	1.067	1.066	1.063	1.059	1.056	1.054	1.051	1.050	1.048	1.046	1.045	1.044	1.043	1.041	1.039	1.039	1.038	1.038	1.036	1.035	1.034	1.033	1.032	1.032	1.031
18	1.067	1.065	1.064	1.061	1.057	1.054	1.051	1.048	1.048	1.046	1.044	1.043	1.042	1.041	1.039	1.038	1.037	1.036	1.036	1.035	1.034	1.033	1.032	1.031	1.030	1.029
20	1.064	1.062	1.061	1.058	1.054	1.051	1.049	1.046	1.046	1.044	1.042	1.041	1.040	1.039	1.037	1.036	1.035	1.034	1.034	1.033	1.032	1.031	1.030	1.029	1.029	1.028
22	1.061	1.059	1.058	1.055	1.051	1.049	1.047	1.044	1.044	1.042	1.040	1.039	1.038	1.036	1.035	1.034	1.033	1.032	1.032	1.031	1.030	1.030	1.029	1.028	1.028	1.027
24	1.058	1.056	1.055	1.052	1.049	1.046	1.044	1.042	1.042	1.040	1.038	1.037	1.036	1.034	1.033	1.032	1.032	1.031	1.031	1.030	1.029	1.028	1.027	1.026	1.026	1.025
26	1.055	1.053	1.052	1.050	1.046	1.044	1.042	1.039	1.039	1.037	1.036	1.036	1.034	1.033	1.032	1.031	1.030	1.029	1.029	1.028	1.027	1.027	1.026	1.025	1.025	1.024
28	1.052	1.050	1.049	1.047	1.044	1.041	1.039	1.037	1.037	1.035	1.034	1.034	1.032	1.031	1.030	1.029	1.029	1.028	1.028	1.027	1.026	1.025	1.024	1.023	1.023	1.022
30	1.049	1.047	1.046	1.044	1.041	1.039	1.037	1.035	1.035	1.033	1.032	1.032	1.030	1.029	1.028	1.027	1.027	1.026	1.026	1.025	1.024	1.024	1.023	1.022	1.022	1.021
32	1.046	1.044	1.043	1.041	1.038	1.036	1.035	1.033	1.033	1.031	1.030	1.030	1.028	1.027	1.026	1.025	1.025	1.024	1.024	1.023	1.022	1.022	1.021	1.021	1.021	1.020
34	1.043	1.041	1.040	1.038	1.036	1.034	1.032	1.031	1.030	1.029	1.028	1.028	1.026	1.025	1.024	1.023	1.023	1.022	1.022	1.022	1.021	1.021	1.020	1.019	1.019	1.018
36	1.039	1.038	1.037	1.035	1.033	1.031	1.030	1.028	1.028	1.027	1.025	1.025	1.024	1.023	1.023	1.022	1.022	1.021	1.021	1.020	1.019	1.019	1.018	1.018	1.017	1.017
38	1.036	1.035	1.034	1.032	1.031	1.029	1.027	1.026	1.025	1.025	1.023	1.023	1.022	1.021	1.021	1.020	1.020	1.019	1.019	1.019	1.018	1.018	1.017	1.016	1.016	1.015
40	1.033	1.032	1.031	1.029	1.028	1.026	1.025	1.024	1.023	1.023	1.021	1.021	1.020	1.019	1.019	1.018	1.018	1.017	1.017	1.017	1.016	1.016	1.015	1.015	1.014	1.014
42	1.030	1.029	1.028	1.026	1.025	1.023	1.023	1.022	1.021	1.021	1.019	1.019	1.018	1.017	1.017	1.016	1.016	1.015	1.015	1.015	1.014	1.014	1.013	1.013	1.013	1.013
44	1.027	1.026	1.025	1.023	1.022	1.021	1.020	1.019	1.019	1.018	1.017	1.017	1.016	1.015	1.015	1.014	1.014	1.014	1.014	1.013	1.013	1.013	1.013	1.012	1.012	1.011
46	1.023	1.022	1.022	1.021	1.020	1.018	1.018	1.017	1.016	1.016	1.015	1.015	1.014	1.014	1.013	1.013	1.013	1.012	1.012	1.012	1.011	1.011	1.010	1.010	1.010	1.010
48	1.020	1.019	1.019	1.018	1.017	1.016	1.015	1.014	1.014	1.013	1.013	1.013	1.012	1.012	1.011	1.011	1.011	1.011	1.011	1.010	1.010	1.010	1.009	1.009	1.008	1.008
50	1.017	1.016	1.016	1.015	1.014	1.013	1.013	1.012	1.012	1.011	1.011	1.011	1.010	1.010	1.009	1.009	1.009	1.009	1.009	1.008	1.008	1.008	1.007	1.007	1.007	1.007
52	1.014	1.013	1.012	1.012	1.011	1.010	1.010	1.009	1.009	1.009	1.009	1.009	1.008	1.008	1.007	1.007	1.007	1.007	1.007	1.006	1.006	1.006	1.005	1.005	1.005	1.005
54	1.010	1.010	1.009	1.009	1.008	1.007	1.007	1.007	1.007	1.007	1.006	1.006	1.006	1.006	1.005	1.005	1.005	1.005	1.005	1.004	1.004	1.004	1.003	1.003	1.003	1.003
56	1.007	1.007	1.006	1.006	1.005	1.005	1.005	1.005	1.005	1.005	1.004	1.004	1.004	1.004	1.003	1.003	1.003	1.003	1.003	1.002	1.002	1.002	1.002	1.002	1.002	1.002
58	1.003	1.003	1.003	1.003	1.003	1.002	1.002	1.002	1.002	1.002	1.002	1.002	1.002	1.002	1.001	1.001	1.001	1.001	1.001	1.001	1.001	1.001	1.001	1.001	1.001	1.001
60	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
62	0.997	0.997	0.997	0.997	0.997	0.997	0.997	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.999	0.999
64	0.993	0.993	0.994	0.994	0.994	0.994	0.995	0.995	0.995	0.995	0.996	0.996	0.996	0.996	0.996	0.996	0.996	0.996	0.996	0.996	0.996	0.997	0.997	0.997	0.997	0.997
66	0.991	0.990	0.990	0.990	0.991	0.992	0.992	0.993	0.993	0.993	0.993	0.993	0.993	0.994	0.994	0.995	0.995	0.995	0.995	0.995	0.995	0.995	0.995	0.996	0.996	0.996
68	0.986	0.986	0.987	0.987	0.988	0.989	0.990	0.990	0.990	0.990	0.991	0.991	0.991	0.992	0.992	0.993	0.993	0.993	0.993	0.994	0.994	0.994	0.994	0.994	0.994	0.994
70	0.983	0.983	0.984	0.984	0.985	0.986	0.987	0.988	0.988	0.988	0.989	0.989	0.989	0.990	0.990	0.991	0.991	0.991	0.991	0.992	0.992	0.992	0.992	0.993	0.993	0.993
72	0.979	0.980	0.981	0.981	0.982	0.983	0.984	0.985	0.986	0.986	0.987	0.987	0.987	0.988	0.988	0.989	0.989	0.989	0.989	0.990	0.990	0.990	0.991	0.991	0.992	0.992
74	0.976	0.976	0.977	0.978	0.980	0.980	0.982	0.983	0.983	0.984	0.985	0.985	0.985	0.986	0.986	0.987	0.987	0.987	0.987	0.988	0.989	0.989	0.989	0.990	0.990	0.990
76	0.972	0.973	0.974	0.975	0.977	0.978	0.979	0.980	0.981	0.981	0.982	0.982	0.983	0.984	0.985	0.986	0.986	0.986	0.986	0.987	0.987	0.987	0.988	0.988	0.989	0.989
78	0.969	0.969	0.970	0.972	0.974	0.975	0.977	0.978	0.978	0.979	0.980	0.980	0.981	0.982	0.983	0.984	0.984	0.984	0.984	0.985	0.986	0.986	0.986	0.987	0.987	0.987
80	0.965	0.966	0.967	0.969	0.971	0.972	0.974	0.975	0.976	0.977	0.978	0.978	0.979	0.980	0.981	0.982	0.982	0.982	0.982	0.983	0.984	0.984	0.985	0.985	0.986	0.986
82	0.961	0.963	0.963	0.966	0.968	0.969	0.971	0.972	0.973	0.974	0.976	0.976	0.977	0.978	0.979	0.980	0.980	0.980	0.980	0.981	0.982	0.983	0.983	0.984	0.984	0.985
84	0.957	0.959	0.960	0.962	0.965	0.966	0.968	0.970	0.971	0.972	0.974	0.974	0.975	0.976	0.977	0.978	0.979	0.979	0.979	0.980	0.981	0.981	0.982	0.982	0.983	0.983
86	0.954	0.956	0.956	0.959	0.961	0.964	0.966	0.967	0.968	0.969	0.972	0.971	0.972	0.973	0.975	0.976	0.977	0.977	0.977	0.978	0.979	0.980	0.980	0.981	0.981	0.982
88	0.950	0.952	0.953	0.955	0.958	0.961	0.963	0.965	0.966	0.967	0.969	0.969	0.970	0.971	0.973	0.974	0.975	0.976	0.976	0.977	0.978	0.978	0.979	0.979	0.980	0.980
90	0.946	0.949	0.949	0.952	0.955	0.958	0.960	0.962	0.963	0.964	0.967	0.967	0.968	0.969	0.971	0.972	0.973	0.974	0.974	0.975	0.976	0.977	0.977	0.978	0.978	0.979
92	0.942	0.945	0.946	0.949	0.952	0.955	0.957	0.959	0.960	0.962	0.964	0.965	0.966	0.967	0.969	0.970	0.971	0.972	0.972	0.973	0.974	0.975	0.975	0.976	0.977	0.977
94	0.938	0.941	0.942	0.946	0.949	0.952	0.954	0.957	0.958	0.959	0.962	0.962	0.964	0.965	0.967	0.968	0.969	0.970	0.970	0.971	0.972	0.973	0.974	0.975	0.975	0.975
96	0.935	0.938	0.939	0.942	0.946	0.949	0.952	0.954	0.955	0.957	0.959	0.960	0.961	0.963	0.965	0.966	0.967	0.968	0.968	0.970	0.971	0.972	0.972	0.973	0.974	0.975
98	0.931	0.934	0.935	0.939	0.943	0.946	0.949	0.952	0.953	0.954	0.957	0.957	0.959	0.961	0.963	0.964	0.965	0.966	0.966	0.968	0.969	0.970	0.971	0.972	0.972	0.973
100	0.927	0.930	0.932	0.936	0.940	0.943	0.946	0.949	0.950	0.952	0.954	0.955	0.957	0.959	0.961	0.962	0.963	0.964	0.964	0.966	0.967	0.968	0.969	0.970	0.971	0.972
105	0.918	0.920	0.923	0.927	0.932	0.935	0.939	0.943	0.943	0.946	0.949	0.949	0.951	0.954	0.956	0.958	0.959	0.960	0.960	0.962	0.963	0.964	0.965	0.966	0.967	0.968
110	0.907	0.911	0.913	0.918	0.923	0.927	0.932	0.936	0.937	0.939	0.943	0.944	0.946	0.949	0.951	0.953	0.954	0.955	0.955	0.957	0.958	0.960	0.961	0.962	0.963	0.964
115	0.897	0.902	0.904	0.910	0.915	0.920	0.925	0.930	0.930	0.933	0.937	0.938	0.940	0.944	0.946	0.948	0.950	0.951	0.951	0.953	0.955	0.956	0.958	0.959	0.960	0.961
120	0.887	0.892	0.894	0.900	0.907	0.912	0.918	0.923	0.924	0.927	0.931	0.932	0.934	0.938	0.941	0.943	0.945	0.946	0.946	0.948	0.950	0.952	0.954	0.955	0.956	0.957
125	0.876	0.881	0.884	0.890	0.898	0.903	0.909	0.916	0.916	0.920	0.925	0.925	0.928	0.933	0.936	0.939	0.940	0.941	0.941	0.943	0.945	0.947	0.950	0.951	0.953	0.954
130	0.865	0.871	0.873	0.880	0.888	0.895	0.901	0.908	0.909	0.913	0.918	0.919	0.923	0.927	0.931	0.934	0.935	0.936	0.936	0.938	0.940	0.942	0.945	0.947	0.949	0.950
135	0.854	0.861	0.863	0.871	0.879	0.887	0.894	0.901	0.903	0.907	0.912	0.913	0.918	0.921	0.926	0.929	0.931	0.933	0.933	0.936	0.938	0.940	0.942	0.943	0.945	0.946
140	0.842	0.850	0.852	0.861	0.870	0.879	0.886	0.893	0.895	0.900	0.905	0.907	0.912	0.915	0.920	0.924	0.926	0.928	0.928	0.931	0.934	0.936	0.938	0.939	0.941	0.942

FIGURES TENTATIVE
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FIGURES TENTATIVE
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Table 2—Reduction of Observed Specific Gravities To Specific Gravities at 60°F/60°F

SPECIFIC GRAVITY AT INDICATED TEMPERATURE

DEGREES FAHRENHEIT

	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.49	0.50	0.51	0.52	0.53	0.54	0.55	0.56	0.57	0.58	0.59	0.60	0.61	0.62	0.63	0.64	0.65	0.66	0.67	0.68	0.69	0.70	0.71	0.72	0.73	0.74	0.75	0.76
-50																0.487	0.500	0.513	0.526	0.538	0.550	0.562	0.575	0.587	0.599	0.610	0.622	0.633	0.644	0.654	0.665	0.675	0.685	0.695	0.705
-45																0.491	0.504	0.517	0.529	0.542	0.554	0.566	0.578	0.590	0.602	0.613	0.625	0.636	0.646	0.657	0.668	0.678	0.688	0.698	0.708
-40															0.483	0.495	0.508	0.521	0.533	0.545	0.558	0.570	0.581	0.593	0.605	0.616	0.628	0.638	0.649	0.660	0.670	0.680	0.690	0.700	0.710
-35															0.487	0.500	0.512	0.525	0.537	0.549	0.561	0.573	0.585	0.596	0.608	0.619	0.630	0.641	0.651	0.662	0.672	0.682	0.692	0.702	
-30															0.491	0.504	0.516	0.529	0.541	0.552	0.564	0.576	0.588	0.600	0.611	0.622	0.634	0.644	0.655	0.665	0.675	0.685	0.695	0.705	
-25															0.496	0.508	0.520	0.532	0.544	0.556	0.568	0.580	0.591	0.603	0.614	0.625	0.636	0.647	0.657	0.667	0.678	0.688	0.698	0.708	
-20												0.488	0.500	0.512	0.524	0.536	0.548	0.559	0.571	0.583	0.594	0.606	0.617	0.628	0.639	0.649	0.660	0.670	0.680	0.690	0.700	0.710			
-15														0.492	0.504	0.516	0.526	0.540	0.552	0.563	0.574	0.586	0.597	0.609	0.620	0.630	0.641	0.652	0.662	0.672	0.682	0.692	0.702		
-10													0.484	0.496	0.508	0.520	0.532	0.543	0.555	0.566	0.578	0.590	0.601	0.612	0.623	0.633	0.644	0.654	0.665	0.675	0.685	0.695	0.705		
-5													0.488	0.500	0.512	0.524	0.536	0.547	0.559	0.570	0.581	0.593	0.604	0.615	0.626	0.636	0.647	0.657	0.667	0.678	0.688	0.698	0.708		
0												0.481	0.493	0.505	0.516	0.528	0.540	0.551	0.562	0.573	0.585	0.596	0.607	0.618	0.628	0.639	0.649	0.659	0.670	0.680	0.690	0.700	0.710		
2												0.483	0.495	0.506	0.517	0.529	0.541	0.552	0.563	0.574	0.586	0.597	0.608	0.619	0.629	0.640	0.650	0.660	0.671	0.681	0.691	0.701			
4												0.484	0.496	0.508	0.519	0.531	0.542	0.553	0.564	0.576	0.587	0.598	0.609	0.620	0.630	0.641	0.651	0.661	0.672	0.682	0.692	0.702			
6												0.486	0.498	0.509	0.520	0.532	0.544	0.555	0.566	0.577	0.589	0.600	0.611	0.621	0.632	0.642	0.652	0.662	0.673	0.683	0.693	0.703			
8												0.487	0.499	0.511	0.522	0.534	0.545	0.556	0.567	0.579	0.590	0.600	0.611	0.622	0.632	0.643	0.653	0.663	0.674	0.684	0.694	0.704			
10												0.489	0.501	0.512	0.523	0.535	0.546	0.557	0.568	0.580	0.591	0.601	0.612	0.623	0.633	0.644	0.654	0.664	0.675	0.685	0.695	0.705			
12												0.491	0.503	0.514	0.525	0.536	0.547	0.558	0.569	0.581	0.592	0.602	0.613	0.624	0.634	0.645	0.655	0.665	0.676	0.686	0.696	0.706			
14												0.492	0.504	0.515	0.526	0.538	0.549	0.560	0.571	0.582	0.593	0.604	0.614	0.625	0.635	0.646	0.656	0.666	0.677	0.687	0.697	0.707			
16												0.494	0.506	0.517	0.528	0.539	0.550	0.561	0.572	0.584	0.595	0.605	0.616	0.626	0.637	0.647	0.657	0.667	0.678	0.688	0.698	0.708			
18												0.495	0.507	0.518	0.529	0.541	0.552	0.563	0.574	0.585	0.596	0.607	0.617	0.627	0.638	0.648	0.658	0.668	0.679	0.689	0.699	0.709			
20											0.486	0.497	0.509	0.520	0.531	0.542	0.553	0.564	0.575	0.586	0.597	0.608	0.618	0.628	0.639	0.649	0.659	0.669	0.680	0.690	0.700	0.710		
22											0.488	0.499	0.511	0.522	0.533	0.544	0.554	0.565	0.576	0.587	0.598	0.609	0.619	0.629	0.640	0.650	0.660	0.670	0.681	0.691	0.701			
24											0.490	0.501	0.512	0.523	0.534	0.545	0.556	0.567	0.578	0.588	0.599	0.610	0.620	0.630	0.641	0.651	0.661	0.671	0.682	0.692	0.702			
26											0.491	0.502	0.514	0.525	0.536	0.547	0.557	0.568	0.579	0.590	0.600	0.611	0.621	0.632	0.642	0.652	0.662	0.673	0.683	0.693	0.703			
28											0.493	0.504	0.515	0.526	0.537	0.548	0.559	0.570	0.581	0.591	0.601	0.612	0.622	0.633	0.643	0.653	0.663	0.674	0.684	0.694	0.704			
30										0.484	0.495	0.506	0.517	0.528	0.539	0.550	0.560	0.571	0.582	0.592	0.602	0.613	0.623	0.634	0.644	0.654	0.664	0.675	0.685	0.695	0.705			
32										0.486	0.497	0.508	0.519	0.530	0.540	0.551	0.561	0.572	0.583	0.593	0.603	0.614	0.624	0.635	0.645	0.655	0.665	0.676	0.686	0.696	0.706			
34										0.488	0.499	0.509	0.520	0.531	0.542	0.553	0.563	0.574	0.584	0.595	0.605	0.615	0.626	0.636	0.646	0.656	0.666	0.677	0.687	0.697	0.707			
36										0.489	0.500	0.511	0.522	0.533	0.543	0.554	0.564	0.575	0.586	0.596	0.606	0.617	0.627	0.638	0.648	0.658	0.668	0.678	0.688	0.698	0.708			
38										0.491	0.502	0.512	0.523	0.534	0.545	0.556	0.566	0.577	0.587	0.598	0.608	0.618	0.629	0.639	0.649	0.659	0.669	0.679	0.689	0.699	0.709			
40									0.483	0.493	0.504	0.514	0.525	0.536	0.546	0.557	0.567	0.578	0.588	0.599	0.609	0.619	0.630	0.640	0.650	0.660	0.670	0.680	0.690	0.700	0.710			
42									0.485	0.495	0.506	0.516	0.527	0.537	0.547	0.558	0.568	0.579	0.589	0.600	0.610	0.620	0.631	0.641	0.651	0.661	0.671	0.681	0.691	0.701				
44									0.486	0.497	0.507	0.517	0.528	0.539	0.549	0.559	0.570	0.580	0.591	0.601	0.611	0.621	0.632	0.642	0.652	0.662	0.672	0.682	0.692	0.702				
46									0.488	0.498	0.509	0.519	0.530	0.540	0.550	0.561	0.571	0.582	0.592	0.603	0.613	0.623	0.633	0.643	0.653	0.663	0.673	0.683	0.693	0.703				
48									0.489	0.500	0.510	0.520	0.531	0.542	0.552	0.562	0.573	0.583	0.594	0.604	0.614	0.624	0.636	0.644	0.654	0.664	0.674	0.684	0.694	0.704				
50								0.480	0.491	0.502	0.512	0.522	0.533	0.543	0.553	0.563	0.574	0.584	0.595	0.605	0.615	0.625	0.635	0.645	0.655	0.665	0.675	0.685	0.695	0.705				
52								0.482	0.493	0.504	0.514	0.524	0.534	0.544	0.554	0.564	0.575	0.585	0.596	0.606	0.616	0.626	0.636	0.646	0.656	0.666	0.676	0.686	0.696	0.706				
54								0.484	0.494	0.505	0.515	0.525	0.536	0.546	0.556	0.566	0.576	0.586	0.597	0.607	0.617	0.627	0.637	0.647	0.657	0.667	0.677	0.687	0.697	0.707				
56								0.486	0.496	0.507	0.517	0.527	0.537	0.547	0.557	0.567	0.578	0.588	0.598	0.608	0.618	0.628	0.638	0.648	0.658	0.668	0.678	0.688	0.698	0.708				
58								0.488	0.498	0.508	0.518	0.528	0.539	0.549	0.559	0.569	0.579	0.589	0.599	0.609	0.619	0.629	0.639	0.649	0.659	0.669	0.679	0.689	0.699	0.709				
60							0.480	0.490	0.500	0.510	0.520	0.530	0.540	0.550	0.560	0.570	0.580	0.590	0.600	0.610	0.620	0.630	0.640	0.650	0.660	0.670	0.680	0.690	0.700	0.710				
62							0.482	0.492	0.502	0.512	0.522	0.532	0.541	0.551	0.561	0.571	0.581	0.591	0.601	0.611	0.621	0.631	0.641	0.651	0.661	0.671	0.681	0.691	0.701					
64							0.484	0.494	0.504	0.513	0.523	0.533	0.543	0.553	0.563	0.573	0.582	0.592	0.602	0.612	0.622	0.632	0.642	0.652	0.662	0.672	0.682	0.692	0.702					
66							0.485	0.495	0.505	0.515	0.525	0.535	0.544	0.554	0.564	0.574	0.584	0.594	0.604	0.614	0.624	0.634	0.644	0.654	0.663	0.673	0.683	0.693	0.703					
68							0.487	0.497	0.507	0.517	0.526	0.536	0.546	0.556	0.566	0.576	0.585	0.595	0.605	0.615	0.625	0.635	0.645	0.655	0.664	0.674	0.684	0.694	0.704					
70						0.479	0.489	0.499	0.509	0.518	0.528	0.538	0.547	0.557	0.567	0.577	0.586	0.596	0.606	0.616	0.626	0.636	0.646	0.656	0.665	0.675	0.685	0.695	0.705					
72						0.481	0.491	0.501	0.511	0.520	0.529	0.539	0.548	0.558	0.568	0.578	0.587	0.597	0.607	0.617	0.627	0.637	0.647	0.657	0.666	0.676	0.686	0.696	0.706					
74						0.483	0.493	0.502	0.512	0.521	0.531	0.541	0.550	0.560	0.569	0.579	0.589	0.598	0.608	0.618	0.628	0.638	0.648	0.658	0.667	0.677	0.687	0.697	0.707					
76						0.484	0.494	0.504	0.513	0.523	0.532	0.542	0.551	0.561	0.571	0.581	0.590	0.600	0.610	0.620	0.629	0.639	0.649	0.659	0.668	0.678	0.688	0.698	0.708					
78						0.486	0.496	0.505	0.515	0.524	0.534	0.544	0.553	0.563	0.572	0.582	0.592	0.601	0.611	0.621	0.630	0.640	0.650	0.660	0.669	0.679	0.689	0.699	0.709					
80					0.479	0.488	0.498	0.507	0.517	0.526	0.535	0.545	0.554	0.564	0.573	0.583	0.593	0.602	0.612	0.622	0.631	0.641	0.651	0.661	0.670	0.680	0.690	0.700	0.710					
82					0.481	0.490	0.500	0.509	0.519	0.528	0.537	0.546	0.555	0.565	0.574	0.584	0.594	0.603	0.613	0.623	0.632	0.642	0.652	0.662	0.671	0.681	0.691	0.701					
84					0.483	0.492	0.501	0.510	0.520	0.529	0.538	0.548	0.557	0.566	0.576	0.585	0.595	0.604	0.614	0.624	0.633	0.643	0.653	0.663	0.672	0.682	0.692	0.702					
86					0.484	0.493	0.503	0.512	0.521	0.531	0.540	0.549	0.558	0.568	0.577	0.587	0.597	0.606	0.616	0.625	0.635	0.644	0.654	0.664	0.673	0.683	0.693	0.703					
88					0.486	0.495	0.504	0.513	0.523	0.532	0.541	0.551	0.560	0.569	0.579	0.588	0.598	0.607	0.617	0.626	0.636	0.645	0.655	0.665	0.674	0.684	0.694	0.704					
90				0.479	0.488	0.497	0.506	0.515	0.524	0.534	0.543	0.552	0.561	0.570	0.580	0.589	0.599	0.608	0.618	0.627	0.637	0.646	0.656	0.666	0.675	0.685	0.695	0.705					
92				0.481	0.490	0.499	0.508	0.517	0.526	0.535	0.544	0.553	0.562	0.571	0.581	0.590	0.600	0.609	0.619	0.628	0.638	0.647	0.657	0.667	0.676	0.686	0.696	0.706					
94				0.483	0.492	0.500	0.509	0.518	0.528	0.537	0.545	0.554	0.563	0.573	0.582	0.591	0.601	0.610	0.620	0.629	0.639	0.648	0.658	0.668	0.677	0.687	0.697	0.707					
96				0.484	0.493	0.501	0.511	0.520	0.529	0.538	0.547	0.556	0.565	0.574	0.584	0.593	0.602	0.612	0.621	0.630	0.640	0.649	0.659	0.669	0.678	0.688	0.698	0.708					
98				0.486	0.495	0.503	0.512	0.521	0.531	0.540	0.549	0.557	0.566	0.576	0.585	0.594	0.603	0.613	0.622	0.631	0.641	0.650	0.660	0.670	0.679	0.689	0.699	0.709					
100			0.480	0.488	0.497	0.505	0.514	0.523	0.532	0.541	0.549	0.558	0.567	0.577	0.586	0.595	0.604	0.614	0.623	0.632	0.642	0.651	0.661	0.671	0.680	0.690	0.700	0.710					
105			0.485	0.493	0.502	0.510	0.518	0.527	0.536	0.545	0.553	0.562	0.571	0.580	0.589	0.598	0.607	0.616	0.626	0.635	0.645	0.654	0.664	0.673	0.683	0.697	0.702					
110		0.481	0.489	0.497	0.506	0.514	0.522	0.530	0.539	0.548	0.557	0.565	0.574	0.583	0.592	0.601	0.610	0.619	0.628	0.638	0.647	0.657	0.666	0.676	0.685	0.695	0.705					
115		0.485	0.493	0.501	0.510	0.518	0.526	0.534	0.543	0.551	0.560	0.568	0.577	0.586	0.595	0.604	0.613	0.623	0.632	0.642	0.651	0.661	0.670	0.680	0.689	0.698	0.707					
120	0.482	0.489	0.497	0.505	0.513	0.521	0.529	0.538	0.546	0.554	0.563	0.571	0.580	0.589	0.598	0.607	0.616	0.626	0.635	0.645	0.654	0.664	0.673	0.683	0.692	0.702					
125	0.486	0.494	0.502	0.509	0.517	0.525	0.533	0.542	0.550	0.558	0.566	0.574	0.583	0.592	0.601	0.609	0.618	0.627	0.636	0.645	0.655	0.664	0.674	0.683	0.693	0.702					
130	0.491	0.498	0.506	0.513	0.521	0.529	0.537	0.545	0.553	0.561	0.569	0.577	0.586	0.595	0.603	0.612	0.621	0.630	0.639	0.648	0.658	0.667	0.677	0.686	0.696	0.705					
135	0.495	0.502	0.510	0.517	0.525	0.533	0.541	0.549	0.557	0.565	0.573	0.581	0.590	0.598	0.606	0.615	0.624	0.633	0.642	0.651	0.661	0.670	0.680	0.689	0.699	0.708					
140	0.499	0.506	0.514	0.521	0.529	0.537	0.545	0.553	0.561	0.569	0.577	0.585	0.594	0.602	0.610	0.619	0.628	0.637	0.646	0.655	0.664	0.674	0.683	0.692	0.702	0.711					

FIGURES TENTATIVE
FOR INFORMATION ONLY

FIGURES TENTATIVE
FOR INFORMATION ONLY

umes at actual loading temperatures to standard volumes at 60 deg. F. or vice versa. Bulk transactions in these products are becoming increasingly common and for such deals reliable and generally acceptable volume correction factors are desirable. The various standards at present in use do not agree well—particularly in the temperature range below 60 deg. F. Also it was felt that the temperature range covered by these standards was somewhat too limited for all possible requirements.

Program Extended

"Accordingly the original rather modest program of checking densities for the temperature range 0-60 deg. F. was extended to a range of —50 to 140 deg. F., and at the request of the A.P.I. Committee on Measuring, Sampling and Testing Natural Gasoline, some tests were made on typical natural gasolines of low, medium and high volatility. Also a few determinations were made on propylene and butene—1."

". . . Table 1 was prepared plotting the data iso-thermally with respect to specific gravity (density) at 60 deg. F. The correlation with specific gravity is considered commercially accurate for the l.p.g. products—which usually consist of two or three closely related components, over the entire temperature range—50 to 140 deg. F. Beyond the l.p.g. range, i.e., for specific gravities above .600, the correlation is likewise considered commercially accurate for the narrower temperature range 0—100 deg. F. By commercially accurate is meant that the volume-correction factors will be correct to one unit in the third decimal place. For the extreme temperature range —50 to 0 deg. F. and 100—140 deg. F. and above .600 specific gravity, the data are less accurate but perhaps represent the best information available in these ranges. The data in Table 1 are plotted according to absolute density. However, in the tabulation of volume correction factors . . . the data have been adjusted to a specific gravity (hydrocarbon at 60 with reference to water at 60) base to be consistent with N.G.A.A. Method for Determining Specific Gravity of l.p.g." Similarly, Table 2 based on specific gravity shows the conversion from observed specific gravity at any temperature to specific gravity at the reference temperature of 60 deg. F., consistent with association standards.

The Technical Committee of the Natural Gasoline Assn., which is sponsoring further work on the gravities of liquefied petroleum gas mixtures, is also sponsoring further studies in low-temperature fractional analysis of gases.

Personnel Listed

Personnel of the 24-man group includes:

H. H. Beeson, Sabine Valley Gasoline Co., Inc., chairman and N.G.A.A. vice-president; C. E. Wharton, Hanlon-Buchanan, Inc., vice-chairman; R. C. Alden, Phillips Petroleum Co.; R. G. Atkinson, Shamrock Oil & Gas Corp.; L. A. Boyd, Warren Petroleum Corp.; R. W. Canfield, J. S. Abercrombie Co.; M. R. Church, Shell Oil Co., Inc.; M. M. Dworkin, Hercules Gasoline Co., Inc.; F. E. Fisher, Skelly Oil Co.; W. F. Fulton, United Gas Pipe Line Co.

R. D. Gibbs, Union Oil Co. of California; Joe Gershovitz, Parade Gasoline Co., Inc.; F. B. Haverfield, Continental Oil Co.; H. J. Hunter, Coltexo Corp.; Fred F. Ketchum, Owens, Libbey-Owens Gas Dept.; E. C. LeFevre, Cities Service Oil Co.; John Middleton, Mid-Co Gasoline Co.; E. M. Parkin, Glacier Production Co.; Norman K. Rector, Glen Rose Gasoline Co.; O. L. Roberts, The Atlantic Refining Co.; C. A. Short, Lisbon Gasoline Co., Inc.; J. L. Thompson, Lone Star Gasoline Co.; Carl Vickburg, The Carter Oil Co.; and D. M. Wolfe, Standard Oil Co. of California.

Refiners' Checklist of Government Orders

(From June 5, 1942 to July 14, 1942)

Below is a summary of orders or revisions of previous orders of various government agencies, which have to do with materials and supplies used by refiners, and with the petroleum products they manufacture.

War Production Board

Protective Helmets. Amendment No. 1 to Limitation Order L-105, WPB, June 5, makes available for industrial workers a substantial number of protective helmets and parts completed or in process on April 29 and which were frozen by original order.

Construction Order Clarified. Interpretation No. 1 to Conservation Order L-41, WPB, June 6, issued to clarify provisions of original order as to costs, building classification according to use, costs of certain equipment, and certain definitions.

New 'Lab' Equipment Only for Certified Uses. Limitation Order L-144, WPB, June 12, sets up classifications for certified users which would seem to include oil companies. All persons affected must keep records and file reports as directed.

Pyrethrum Under Complete Allocation. General Preference Order M-179, WPB, June 13 places pyrethrum, used in insecticides, under complete allocation and end-use control. Form PD-591 required to obtain supplies and producers must file reports as required.

Priority Rating for Gauges, Measuring Tools, etc. General Preference Order E-5, WPB, June 15, limits sale of gauges, precision measuring tools, chucks or testing instruments without priority rating A-10 or better. Order replaces E-1-a, revised. Producers' present production and delivery schedules should be maintained for 30 days from June 15 without change.

Copper and Its Alloy Use Limited. Interpretation No. 4 of M-9-c, WPB, June 15, 1942, prohibits use of copper and its alloys in manufacture of pipes and fittings for water supply and distribution systems. Does not apply to plumbing fixtures in building or water meters.

M-68, M-68-c Restrictions Don't Apply to Canadians. Amendment No. 1 to Priority Rating Order P-98, WPB, June 19, extends provisions of P-98 to Canadian oil firms. Restrictions under M-68 and M-68-c apply only to U. S., territories and possessions; Canadian government regulations will restrict P-98 rating application by Canadian firms.

Typewriter Order Clarified. Interpretation No. 3 of Limitation Order L-54-a, WPB, June 30, clarifies confusion over the definition of billing and continuous-form handling typewriters which are exempted from the order. Clarification states that order includes only continuous forms handling machinery, typewriter principle, having carbon paper-handling devices constructed as integral part of machinery, billing machines, accounting principle, and collateral equipment. Any other typewriters having devices for billing, etc., are subject to L-54-a.

P-98 Extended Through July 31. Amendment 2 to Preference Rating Order P-98 WPB, June 30, extends life of order through July 31, and amends order to effect that suppliers who are Class 1 producers—companies using $5000 or more worth of basic metals in a quarter as defined by Priorities Regulation No. 11—are forbidden to extend ratings except under procedure prescribed by that regulation; preference ratings assigned by P-98 may be extended only in conformity with uniform method prescribed by Priorities Regulation No. 3.

Butadiene Placed Under Allocation. Order M-178, WPB, July 1, puts butadiene under allocation, applies to both producers and buyers. Form PD-33, covering all chemicals used in manufacture of synthetic rubber, must be sent to director of Industry Operations. Reference M-178.

Metal Shelving Manufacture Terminated Except for War Use. Amendment 3 to Limitation Order L-13-a, WPB, July 1, orders manufacturers of metal shelving to accept no orders except as authorized by WPB. Authorizations will be issued only for direct delivery to armed forces or Maritime Commission.

Heat-Resistant Steel Alloys Scaled to Wartime Basis. Materials Order M-21-g, WPB, July 3, sets up maximum specifications for heat-resistant alloys used in metallurgical furnaces, oil refineries, synthetic rubber plants, cement mill furnaces and power plant equipment. New specifications are designed to save nickel and chromium. Materials fabricated by effective date of order and materials under contract where it would be impractical to change specifications—providing delivery is within 60 days of effective date—are excepted.

Auto, Truck Parts Under Production Curb. Limitation Order L-158, WPB, July 4, supersedes Orders L-35, L-4 and L-4-c relating to spare parts for trucks, autos, and off-the-highway vehicles. Provides for manufacture of minimum number of parts necessary to retain efficiency of country's motor transportation system; consumers must turn in a used spare part before accepting delivery of new part; no new part may be sold to replace a part which can be reconditioned by a distributor.

Bauxite and Alumina Placed Under Allocation Control. Materials Order M-1-h, WPB, July 7, effective August 1, placed bauxite and alumina under complete allocation control to assure plentiful supply

Handle SLUDGE

the Load Lugger way

This folder tells how a hard job can be made easy by using several detachable dump buckets for handling sludge at refineries, storage plants and marine terminals. As each bucket is filled at the tank, it is picked up by the LOAD LUGGER, hauled away and dumped. The hoisting unit fits on any standard truck chassis. For further details of this economical method—

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for manufacture of aviation gasoline, aluminum and abrasives. Purchasers affected file PD-567, PD-568.

Office of Price Administration

Price Ceilings Removed for Aviation 'Gas', Synthetic Rubber, etc. Amendment 7 to supplementary Regulation No. 1 to General Maximum Price Regulation, and Amendment No. 18 to Revised Price Schedule No. 88, OPA, June 13, removes price ceilings on synthetic rubber, aviation gasoline, toluene manufactured from petroleum and materials essential thereto. Certified copies of all contracts involving sale, purchase or exchange must be filed with OPA within 15 days after signing.

Price Ceilings Set on Fabricated Concrete Reinforcing Bars. Maximum Price Regulation No. 159, OPA, June 15, sets maximum prices on fabricated concrete reinforcing bars which permit fabricator 50c per 100 lbs. margin above cost at steel mill, and provide for passing on to consumer all charges for freight from mill to fabricator and from fabricator to consumer.

Anti-Freeze Price Maximums Set. Maximum Price Regulation No. 170, OPA, June 30, set maximum prices, both wholesale and retail, for all types of anti-freeze.

Government Emergency Purchases Excluded from General Price Regulation. Amendment No. 5 to General Maximum Regulation, OPA, June 30 excludes government purchases from any monetary limitation for immediate delivery of any commodity for which there is an emergency need.

Miscellaneous

7-Man Group to Pass on Labor Production Problems. Policy committee of 3 men from each of the major labor organizations was appointed June 9 by Wendell Lund, WPB Labor Production Division, who will be chairman. Committee will determine major questions of production policy and organization.

Priority Applicants to Use Case Numbers for Queries. WPB, July 7, announced new service for applicants using individual PD-1A certificates. Applicants will enclose with application blank a self-addressed postcard, on the back of which WPB will stamp case number assigned application, and return the card to applicant to facilitate handling of subsequent inquiries with respect to that application.

Lend-Lease Sales on Basis of Domestic Sales. Explanation by OPA Chief Henderson June 16. Sales of goods and commodities to Lend-Lease agencies, British Purchasing Commission, Treasury Procurement agencies, etc., are in general domestic sales subject to specific domestic price schedules or regulations rather than maximum export price regulation.

Can't Split Iron, Steel Orders to Get Higher Prices. Warning by OPA Chief Henderson that deliberate sales of iron and steel products in just-under carload quantities to get higher prices permitted under less-than-carload lots is evasion of Revised Price Schedule No. 49.

OPA Creates New Labor Office. Labor office within OPA created July 2, headed by Robert R. R. Brooks, to act as liaison between organized labor, OPA and other agencies influencing or determining wage policy and rates. Office will be assisted by recently-created labor policy committee composed of AFL, CIO and Railway labor group representatives.

ODT Field Offices to Handle Special Permits. Office of Defense Transportation, June 30, authorized managers of motor transport division field offices to handle applications and to issue special permits; appeals from field office managers may be taken to John L. Rogers, director of motor transport division, Interstate Commerce Bldg., Washington.

Heat Exchanger Production Pushed. Heat exchanger industry advisory committee is taking steps to seek facilities capable of producing $200,000,000 worth of heat exchangers critically needed in the war program before July 1, 1943.

Heat Transfer Data For Plant Designers

"Heat Transmission", by William H. McAdams, has been recently revised and enlarged to include new developments and improvements derived from modern experimental methods since the first edition was published in 1933. Much of this new material is said to be so buried in the general literature that it has been largely unavailable to the student and the practicing engineer.

Second edition, like the first, is sponsored by the National Research Council, heat transmission committee. The author is professor of chemical engineering at Massachusetts Institute of Technology.

Following same general plan as the first edition, the second treats the subject in three general classifications: Conduction, convection and radiation. New information, for example, has been added on: Mechanisms of heat transfer across boundary surfaces from data revealed by photographic investigation; improved methods of computation, such as calculation of unsteady conduction for many special shapes from combination of values for the slab, cylinder and sphere, together with convenient design procedure for exchangers by development of typical cases. Correlations of the first edition are extended by use of much new data and new ones are included; illustrations in the text include graphical treatments of greatest utility to the designer.